

# **Environmental Assessment**

---

**Green-Duwamish General Investigation  
Ecosystem Restoration**

## **North Wind's Weir Intertidal Restoration Duwamish River Tukwila, Washington**



**FINAL  
April 2006**



**US Army Corps  
of Engineers®**  
Seattle District





REPLY TO  
ATTENTION OF

**DEPARTMENT OF THE ARMY**  
**SEATTLE DISTRICT, CORPS OF ENGINEERS**  
P.O. BOX 3755  
SEATTLE, WASHINGTON 98124-3755

CENWS-PM-PL-ER

**North Wind's Weir Intertidal Restoration Project**  
**Tukwila, King County, Washington**

**Finding of No Significant Impact**

**1. Background.** The Seattle District, U.S. Army Corps of Engineers (Corps), in partnership with the King County Department of Natural Resources and Parks, Water and Land Resources Division (King County DNRP) is proposing to restore approximately 3.27 acres of habitat along the lower Duwamish River at the North Wind's Weir Intertidal Restoration project site. The site would be restored by excavating approximately 20 feet of fill material, regrading the site to intertidal elevations, reconnecting the site to the river, restoring the natural shoreline, and planting native intertidal marsh and riparian vegetation. The project, as proposed and considered by the Services, entailed initially retaining the riverbank intact and constructing the recommended alternative features behind a berm separating the project from the Duwamish River, and at the conclusion of construction opening the berm to permit free communication between the project site and the Duwamish River.

**2. Purpose and Need.** The purpose of this restoration project is to restore critical intertidal mudflat, marsh, and riparian habitat to the lower Duwamish River. The mud flats and marshes which once characterized the lower Green/Duwamish River estuary have been almost completely destroyed by dredging and filling activities that occurred between the late 1800's and the mid-1900's. Today, only about 1 percent of an estimated 4,000 acres of tidal and intertidal habitat remains as thin bands of mudflat and small, widely scattered patches of marsh fringing the toe of rip rapped shorelines.

Because intertidal mudflats and salt marshes provide critical foraging and refuge habitat for juvenile salmon, among other native fish and wildlife species, restoration of these habitats is a key component of the basin-wide restoration plan articulated in the Green/Duwamish River Basin Ecosystem Restoration Program. The project site is physically located at the upstream edge of saltwater intrusion into the river (i.e. estuarine transition zone). A recently completed study of Chinook salmon in the lower Duwamish River has documented a concentration of juveniles within this estuarine transition zone, and particularly in the area of the river adjacent to the project site.

**3. Proposed Action.** The project site is located along the eastern bank of the lower Duwamish River at approximately River Mile 6.2, within the City of Tukwila Washington. The project area encompasses approximately 3.27 acres and encompasses a small patch of remnant salt marsh. The site is currently vacant industrial land on top of

nearly 20 feet of historic fill held in place by an armored shoreline. Portions of the fill material are contaminated with hydrocarbons and a single exceedance in arsenic levels in the groundwater has been recorded at the site. All structures have been demolished and the fill material is largely unvegetated, with the exception of scattered black cottonwood and white poplar trees.

The majority of the site would be lowered to intertidal elevations (+1.35 to 6.35 MLLW) and would be connected to the Duwamish River off the east side of the rock weir and its associated scour pool, as presented in the January 5, 2004 Public Notice CENWS-PL-04-02. This would create approximately 1.66 acres of tidal channel and associated intertidal mudflat and approximately 0.76 acres of intertidal and high marsh between elevations. A scrub-shrub wetland community of approximately 0.17 acres would gradually transition to a forested riparian buffer encompassing approximately 0.29 acres to the top of the area of excavation. The upstream side of the entrance channel would be armored and bank stabilized with approximately 300 cubic yards of angular rock to better maintain the existing hydrodynamics of the shoreline, better preserve the undisturbed portion of the existing saltmarsh, and support a self-maintaining channel opening. The top and backside of the armoring would be capped with soil and planted with vegetation to increase habitat function and improve aesthetics.

Much of the existing riprap and abandoned rubble along the shoreline would be excavated and removed. Approximately 0.06 acres of the western side of the existing intertidal marsh would be disturbed to match graded contours with existing contours, but would be salvaged and replanted within the restoration site. A crushed rock trail from South 112<sup>th</sup> Street around the outer buffer of the site would direct visitors down to the river's edge while providing them viewing areas to see the restoration site and read interpretive signs. The trail would end at the river's edge with a crushed rock boat ramp suitable for hand-launch crafts such as kayaks and canoes.

Construction and implementation work will be initiated on the upland portion of the recommended alternative -- i.e., that portion of the project footprint that falls landward of the bankfull elevation. ESA consultation has been reinitiated under 50 CFR 402.16 on project activities falling below the MHW line in relation to recent critical habitat designations for Puget Sound Chinook salmon and Coastal/Puget Sound bull trout. The Corps will refrain from any project work below the mean high water line, and thus within designated critical habitat, until the reinitiated consultation process is concluded. In light of the fact that the Corps expects and intends to provide a net environmental benefit through this ecosystem restoration project, enhancing habitat for listed and non-listed species alike, the Corps is prepared to adopt and implement all reasonably conceivable reasonable and prudent measures and/or alternatives that may be directed by the Services under Section 7(a), prior to undertaking the in-water work.

**4. Summary of Environmental Impacts.** Impacts from the excavation and construction activities will generally be highly localized in nature, short in duration, and minor in scope. While there will likely be small-scale, temporary increases in turbidity and decreases in dissolved

oxygen within the river channel as a result of connecting the restoration site with the river channel, these impacts will be localized and temporary, occurring only during the portions of the construction sequence that require 'in water' work. In order to reduce these impacts and potential related effects on juvenile salmonids in the river, all 'in-water' construction work will take place during the appropriate fish window (August 1 to August 31) and will take place during the lowest portions of the tidal cycle. This will minimize the short-term effects of the project on juvenile salmonids and allow for maximum recovery of the benthic, epibenthic, and forage fish communities prior to the subsequent year's juvenile salmonid outmigration period. The in-water construction of this project will occur when federally listed threatened juvenile and adult Puget Sound chinook salmon and Coastal/Puget Sound bull trout are least likely to be present in the Duwamish River. This in-water work period also coincides to the portion of the year when bald eagles are not nesting and are most tolerant of disturbance.

Positive effects of this restoration project include the elimination of approximately 234 lineal feet of armored shoreline, as well as approximately 2.6 acres of industrial fill and associated chemical constituents from the shoreline of the lower Duwamish River. Petroleum-contaminated soil would be removed or isolated from contact with or migration to intertidal surfaces. Any underground objects and associated contamination would be removed. Any measures that are necessary with respect to the arsenic in the groundwater would be performed.

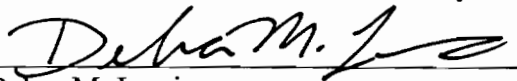
No significant adverse impacts to air quality, noise, aesthetics, historical resources, cultural resources, recreational resources, or the social or economic environment are anticipated as a result of this project. There will be no effect on known Native American and cultural resource sites or impacts to fishing rights of Native American Tribes. Archaeological monitoring during construction will be conducted to minimize the potential for excavation to affect unrecorded historic properties below the existing fill material. Construction vehicles may temporarily disrupt local traffic, increase air emissions and noise in the vicinity of the site, increase the volume of traffic on adjacent streets during excavation, and decrease the aesthetic attractiveness of the general area during excavation of the site. However, these impacts are expected to be temporary and highly localized and will be managed through implementation of appropriate control plans.

The attached Final Environmental Assessment provides an evaluation of the proposed restoration project and its effects on the existing environment; it includes a Clean Water Act Section 401 Water Quality Certification and Coastal Zone Consistency Certification, Clean Water Act 404 Public Notice, Endangered Species Act concurrence letters from the U.S. Fish and Wildlife Service and NOAA Fisheries Service, and the National Historic Preservation Act Section 106 compliance letter from the State Historic Preservation Officer.

**5. Finding.** Based on the analysis detailed in the final EA (attached) and summarized above, this project is not a major Federal action significantly affecting the quality of the human environment and, therefore, does not require preparation of an environmental impact statement. The construction and implementation activities in the upland portion of the project site are not expected to foreclose or limit the choice of reasonable alternatives that may become necessary as

a result of the reinitiated consultation. In the event that the reinitiated consultation process results in substantial changes in the project that are relevant to environmental concerns not already considered by the Corps in this EA, the Corps will withdraw the FONSI at that time, re-evaluate the impacts of the project on the quality of the human environment, modify the EA as necessary, and as necessary promulgate a replacement FONSI or initiate an Environmental Impact Statement.

19 Apr 06  
Date

  
Debra M. Lewis  
Colonel, Corps of Engineers  
District Commander

**North Wind's Weir Intertidal Restoration**  
**Duwamish River**  
Tukwila, Washington  
April 2006

Environmental Assessment

**Responsible Agencies:** The agencies responsible for this project are the U.S. Army Corps of Engineers, Seattle District (Corps), and the King County Department of Natural Resources and Parks, Water and Land Resources Division (King County DNRP), along with a number of other groups which provided funds toward acquisition of the site. These groups include the City of Tukwila, the Salmon Recovery Funding Board (SRFB), the Washington State Department of Natural Resources Aquatic Lands Enhancement Account (ALEA), the Elliott Bay/Duwamish Restoration Program, and the City of Seattle.

**Summary:** Nearly all intertidal marsh and mudflat habitats of the Duwamish River have been eliminated as a result of dredging and filling of the estuary for urban and industrial development; only about 1 percent of an estimated 4,000 acres of tidal and intertidal habitat remains today. As a result, the river and its estuary have lost the ecological functions of these intertidal areas, including critical rearing and refuge habitat for juvenile salmon. The majority of the project area has been excavated and filled with industrial debris, and much of the shoreline has been armored. As a result, the project area is substantially elevated above the river, isolated from tidal influence, inaccessible to fish, and virtually uninhabitable by native vegetation and wildlife species.

The Corps and its partner agencies are therefore proposing to remove the historic fill and shoreline armoring and restore the connection of this site to the river and the tides. This project would restore critical intertidal functions such as foraging and refuge habitat for juvenile salmon by restoring mudflat, marsh, and riparian habitats. In accordance with the National Environmental Policy Act (NEPA), this document evaluates the potential environmental impacts of the proposed restoration alternative.

Impacts will generally be highly localized in nature, short in duration, and minor in scope. As the site is compacted and/or disturbed, there will be virtually no temporal loss of habitat. Minor temporal losses will be compensated for through restoration of tidal connectivity that will restore a variety of native habitats where none now exist. Impacts from this restoration project should not be significant, either individually or cumulatively.

The official comment period on the draft Environmental Assessment (EA) extended from January 5 to February 6, 2004. In the interim period since the publication of the draft EA, the Southern Resident Distinct Population Segment of killer whales has been listed as an endangered species, and critical habitat for both Puget Sound Chinook salmon and Coastal/Puget Sound bull trout has been designated. The Corps has determined that the project will have no effect on killer

whales, but has reinitiated consultation with NOAA Fisheries and USFWS regarding potential impacts to critical habitat for Chinook salmon and bull trout. The Corps intends to proceed with the construction and restoration activities in the upland portion of the recommended alternative, while awaiting the conclusion of the consultation process covering activities within the portion of the project footprint that falls below the bankfull elevation. Please refer to the text of the EA, Section 5.6, Threatened and Endangered Species, for additional discussion of this issue. Otherwise, there are no significant new circumstances or information relevant to environmental concerns and bearing on the proposed project or its impacts that have arisen since the close of the public comment period.

This document is available online at: <http://www.nws.usace.army.mil/ers/envirdocs.html>

Hard copies of the Programmatic Biological Assessments and the draft EA document (including appendices) were available from the Corps upon request during the public comment period.

Requests for additional information were sent to:

Ms. Victoria Luiting, Environmental Resources Section  
U.S. Army Corps of Engineers, P.O. Box 3775  
Seattle, Washington 98124-3755  
victoria.t.luiting@usace.army.mil  
206-764-4476

## TABLE OF CONTENTS

<b>1.0</b>	<b>INTRODUCTION.....</b>	<b>1</b>
1.1	PROJECT LOCATION .....	2
1.2	PROJECT PURPOSE AND NEED .....	3
1.3	AUTHORITY .....	3
1.4	ASSOCIATED STUDIES AND REPORTS .....	4
<b>2.0</b>	<b>ALTERNATIVES CONSIDERED .....</b>	<b>5</b>
2.1	THE NO-ACTION ALTERNATIVE.....	5
2.2	ALTERNATIVE 1 – SINGLE ENTRANCE INTERTIDAL MARSH .....	5
2.3	ALTERNATIVE 2 – DOUBLE ENTRANCE MUDFLAT .....	6
2.4	ALTERNATIVE 3 – SINGLE ENTRANCE INTERTIDAL MARSH AND MUDFLAT .....	7
<b>3.0</b>	<b>DESCRIPTION OF THE PREFERRED ALTERNATIVE:.....</b>	<b>7</b>
3.1	RESTORATION OF TIDAL CONNECTIVITY AND INTERTIDAL HABITATS .....	7
3.2	RESTORATION OF HABITAT COMPLEXITY AND FUNCTIONAL BENEFITS .....	9
3.3	DIRECTED HUMAN ACCESS AND PASSIVE RECREATIONAL USE.....	9
3.4	COMPARATIVE ENVIRONMENTAL IMPACTS AND BENEFITS .....	10
<b>4.0</b>	<b>EXISTING CONDITIONS .....</b>	<b>10</b>
4.1	PHYSICAL CHARACTERISTICS .....	11
4.1.1	<i>Green/Duwamish River Basin: Historic Conditions.....</i>	<i>11</i>
4.1.2	<i>Green/Duwamish River Basin: Current Conditions.....</i>	<i>11</i>
4.1.3	<i>Geology and Soils .....</i>	<i>12</i>
4.1.4	<i>Hazardous and Toxic Materials.....</i>	<i>12</i>
4.1.5	<i>Hydrologic Regime .....</i>	<i>15</i>
4.2	WATER QUALITY .....	16
4.2.1	<i>Water Quality Class.....</i>	<i>16</i>
4.2.2	<i>Turbidity.....</i>	<i>16</i>
4.2.3	<i>Dissolved Oxygen.....</i>	<i>17</i>
4.2.4	<i>Temperature.....</i>	<i>17</i>
4.3	VEGETATION.....	17
4.3.1	<i>Subtidal and Intertidal Vegetation.....</i>	<i>17</i>
4.3.2	<i>Riparian and Upland Vegetation .....</i>	<i>18</i>
4.4	FISH .....	19
4.4.1	<i>Anadromous Salmonids .....</i>	<i>19</i>
4.4.2	<i>Forage Fish.....</i>	<i>20</i>
4.5	WILDLIFE.....	20
4.5.1	<i>Birds.....</i>	<i>20</i>
4.5.2	<i>Marine Mammals.....</i>	<i>21</i>
4.5.3	<i>Amphibians, Reptiles, and Terrestrial Mammals .....</i>	<i>22</i>
4.6	THREATENED AND ENDANGERED SPECIES .....	22
4.6.1	<i>Puget Sound Southern Resident Distinct Population Segment of Killer Whales..</i>	<i>22</i>
4.6.2	<i>Puget Sound Chinook Salmon Critical Habitat .....</i>	<i>23</i>
4.6.3	<i>Coastal/Puget Sound Bull Trout Critical Habitat .....</i>	<i>23</i>
4.7	CULTURAL RESOURCES .....	24

4.8	NATIVE AMERICAN CONCERNS.....	24
4.9	LAND USE.....	25
4.10	RECREATION.....	25
4.11	AIR QUALITY AND NOISE.....	25
4.12	TRANSPORTATION.....	26
4.13	AESTHETICS.....	26
<b>5.0</b>	<b>ENVIRONMENTAL EFFECTS OF THE PREFERRED ALTERNATIVE .....</b>	<b>27</b>
5.1	PHYSICAL CHARACTERISTICS .....	27
5.1.1	<i>River Basin</i> .....	27
5.1.2	<i>Geology and Soils</i> .....	27
5.1.3	<i>Hazardous and Toxic Materials</i> .....	28
5.1.4	<i>Hydrologic Regime</i> .....	28
5.2	WATER QUALITY .....	29
5.2.1	<i>Water Quality Class</i> .....	29
5.2.2	<i>Turbidity</i> .....	29
5.2.3	<i>Dissolved Oxygen</i> .....	30
5.2.4	<i>Temperature</i> .....	30
5.3	VEGETATION.....	31
5.3.1	<i>Subtidal and Intertidal Vegetation</i> .....	31
5.3.2	<i>Riparian and Upland Vegetation</i> .....	32
5.4	FISH .....	32
5.4.1	<i>Anadromous Salmonids</i> .....	32
5.4.2	<i>Forage Fish</i> .....	33
5.5	WILDLIFE.....	34
5.5.1	<i>Birds</i> .....	34
5.5.2	<i>Marine Mammals</i> .....	35
5.5.3	<i>Amphibians, Reptiles, and Terrestrial Mammals</i> .....	35
5.6	THREATENED AND ENDANGERED SPECIES .....	36
5.7	CULTURAL RESOURCES .....	39
5.8	NATIVE AMERICAN CONCERNS.....	39
5.9	LAND USE.....	39
5.10	RECREATION.....	40
5.11	AIR QUALITY AND NOISE.....	41
5.12	TRANSPORTATION.....	41
5.13	AESTHETICS.....	42
<b>6.0</b>	<b>UNAVOIDABLE ADVERSE EFFECTS .....</b>	<b>42</b>
<b>7.0</b>	<b>IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES</b>	<b>43</b>
<b>8.0</b>	<b>CUMULATIVE IMPACTS .....</b>	<b>43</b>
<b>9.0</b>	<b>ENVIRONMENTAL COMPLIANCE .....</b>	<b>44</b>
<b>10.0</b>	<b>CONCLUSION .....</b>	<b>46</b>
<b>11.0</b>	<b>PUBLIC REVIEW AND COMMENTS .....</b>	<b>46</b>

11.1	COMMENT .....	46
11.2	RESPONSE .....	47
<b>12.0</b>	<b>LITERATURE CITED .....</b>	<b>49</b>

## **TABLES, PHOTOS, and FIGURES**

TABLE 1.	Project Goals, Objectives, and Constraints
TABLE 2.	Protected Species Addressed in Programmatic Biological Assessments
TABLE 3.	Threatened and Endangered Species Effect Determination Summary
PHOTO 1.	Aerial view of site
PHOTO 2.	Rock weir
PHOTO 3.	Existing mudflat and marsh
PHOTO 4.	Area of marsh to be salvaged and replanted
FIGURE 1.	Location and Vicinity Map and Notes (Sheets 1 and 2)
FIGURE 2.	Grading Plan, Notes, and Legend (Sheet 3)
FIGURE 3.	Erosion and Sediment Control Plan (Sheet 4)
FIGURE 4.	Cross Sections (Sheet 5)
FIGURE 5.	Planting Plan, Details, and Notes (Sheet 6)
FIGURE 6.	Soil Test Pit Locations

## **APPENDICES**

APPENDIX A.	Washington Department of Ecology Clean Water Act Section 401 and Coastal Zone Management Certification
APPENDIX B.	ESA Concurrence Letters for the Programmatic Biological Assessments
APPENDIX C.	National Historic Preservation Act, Section 106 compliance letter
APPENDIX D.	Public Notice CENWS-PL-04-02
APPENDIX E.	Comments received from reviewers of the draft EA

## 1.0 INTRODUCTION

During the summer of 2006, the Corps and King County Department of Natural Resources and Parks (King County DNRP) are proposing to restore the historic tidal connectivity and intertidal habitats of the project area. The proposed restoration work includes: (1) removing between 7 and 20 feet of fill material from the site, including steel slag, concrete pads, and associated industrial debris (2) removing riprap and blackberries along the shoreline, (3) grading the site to elevations typical of intertidal mudflat and marsh, and (4) planting native intertidal marsh and riparian forest communities.

In accordance with the National Environmental Policy Act (NEPA), this Environmental Assessment (EA) evaluates the potential environmental impacts of the proposed restoration project.

This restoration activity is being conducted as part of the Green/Duwamish River Basin Ecosystem Restoration Program. In this program, the Corps has served as the lead in developing the restoration program for the Green/Duwamish River, working with local agencies to identify, evaluate, prioritize, and coordinate implementation of potential restoration projects to assure that the restoration programs and projects from the various agencies complement each other. As part of this ecosystem approach, two major documents have been prepared that provide general information regarding the Green/Duwamish River basin and its associated existing conditions, fish and wildlife populations, and potential impacts on federally listed endangered or threatened species. The documents are as follows:

Final Programmatic Environmental Impact Statement and Restoration Plan (FPEIS) for the Green/Duwamish River Basin Ecosystem Restoration Program, prepared by the Seattle District Corps and King County DNR in November 2000.

Programmatic Biological Assessments for Green/Duwamish Ecosystem Restoration Program, King County, Washington.

Separate documents were prepared for species under National Marine Fisheries and US Fish and Wildlife jurisdictions for the Seattle District Corps by Jones & Stokes, June 2000.

Information from these reports has been incorporated into this document largely by reference. The purpose and need statement for the Programmatic Draft NEPA/SEPA Environmental Impact Statement (DEIS) and Restoration Plan was to improve the overall health of the Green/Duwamish River basin ecosystem for fish and wildlife species by increasing the quantity, quality, diversity, and connectivity of available habitat. The need for such improvement to the ecosystem was well established from years of study conducted by the U.S. Army Corps of Engineers (Corps), King County, the Port of Seattle, the Muckleshoot Indian Tribe Fisheries Department, the Washington State Department of Fish and Wildlife, and others.

The overall objective of the restoration project is to restore significant ecosystem function, structure, and dynamic processes that have been degraded within the river basin. To accomplish this objective, the following basin-wide restoration goals were identified:

- Improve the physical nature of existing degraded habitat.
- Improve existing ecosystem functions and values. This includes improving riverine processes where reasonable.
- Address important factors limiting habitat productivity.

The Programmatic EIS assessed the Corps proposal to implement a basinwide restoration program in the Green/Duwamish River. The purpose of preparing a programmatic EIS was to expedite and provide a point of departure for future site-specific projects, and to facilitate the preparation of subsequent project-specific NEPA and SEPA documents through the use of “tiering” or “phasing.” The origin of this restoration plan and EIS was an Ecosystem Restoration Study (ERS) conducted as a part of the Corps’ Ecosystem Restoration Program. Restoration features at sixty-seven projects in the basin were developed and evaluated to determine the most cost effective and beneficial plan to recommend for restoration of the basin ecosystem. The recommended plan would implement a combination of 45 project-specific and programmatic restoration measures throughout the basin. This recommended National Ecosystem Restoration Plan (NER) was selected based upon cost effectiveness and incremental cost evaluation of alternative’s costs and environmental outputs. The recommended NER Plan restores aquatic and terrestrial ecosystem continuity and connectivity and addresses all limiting habitat factors for threatened and endangered salmonids within the basin.

From the suite of available projects, the Green Duwamish ERP Program Manager Committee prioritized the order of implementation. The WRIA 9 Forum approved their selections. North Winds Weir was identified as one of five projects that would be considered in the first year of construction. This was based on the availability of land, willingness of the local sponsor to fund the project, and advance engineering work that was done for this project.

## 1.1 Project Location

The project area is located along the eastern bank of the lower Duwamish River at approximately River Mile 6.2, in the southeast quarter of Section 4, Township 23 North, Range 4 East, within the City of Tukwila Washington (Figure 1). The project area encompasses approximately 3.27 acres (including areas waterward of Mean Higher High Water that are exposed at low tide), and is bordered on the west by the Duwamish River and a fringe of intertidal habitats, to the north by Seattle City Light property, to the east by an existing industrial facility (Pacific Strapping Inc.), and to the south by South 112<sup>th</sup> Street (Photo 1). The project area is directly across the river from an intertidal habitat restoration project (the Cecil B. Moses Park) recently completed in early 2003 by the Elliott Bay Duwamish Restoration Panel that included KC DNRP and the City of Seattle (Photo 2).

Existing land use consists of vacant industrial land on historic fill material. Property topography is flat, with 0 to 3 percent slopes. All structures have been demolished and the fill material is largely unvegetated, with the exception of scattered red alder (*Alnus rubra*) and black cottonwood (*Populus balsamifera*) trees (Photo 1). The property is fringed on the east and south by a small group of ornamental white poplar (*Populus alba*) trees, with a scattered and disturbed understory of non-native shrubs. The western shoreline has been rip-raped and currently supports a dense thicket of Himalayan blackberry (*Rubus discolor*). Approximately 11 feet in elevation below the eastern edge of the site, a small patch of intertidal saltmarsh dominated by

Lyngby's sedge (*Carex lyngbyei*) and an extensive area of unvegetated mudflat fringe the Duwamish River (Photo 3). Two large concrete pads from abandoned buildings are present in the central portion of the site. A sparse mixture of grasses, blackberries, and other disturbance adapted plants are scattered across the site. A large rock outcrop, locally referred to as the North Wind's Weir, is located within the river, just off the southwestern corner of the project area (Photo 2).

## **1.2 Project Purpose and Need**

The lower Green/Duwamish River estuary was historically an area of very low gradient with a sinuous, meandering main channel. Most of the larger sediment had been deposited in the middle river, and the lower river had primarily sand and mud substrate. The original intertidal mud and sand flats historically extended east to what is now Interstate 5 and west to the West Seattle Hills. The Duwamish River originally flowed through the mud flats in three braided, winding channels. Substantial areas of marsh vegetation (approximately 1,270 acres) and forested tidal swamps (approximately 1,230 acres) existed upstream (south) of these intertidal mud and sand flats. Large woody debris was carried into the lower river and estuary from the upper watershed during floods (Perkins 1993, USACE 1997a, 1997b).

The estuarine mud flats and marshes were nearly completely destroyed by dredging and filling activities that occurred between the late 1800's and the mid-1900's as part of an early plan for a canal that would establish a navigable link between the salty waters of Puget Sound and the inland fresh waters of Lake Washington. Ultimately, intertidal habitats in the Duwamish River were reduced from about 2,100-2,500 acres to less than 25 acres (Benoit 1979, Bortleson et al. 1980, Blomberg et al. 1988).

Thus, the purpose of the North Wind's Weir Intertidal Restoration Project is to restore important intertidal habitat within the lower Duwamish River, with the intent of specifically providing mudflat and saltmarsh habitats suitable for rearing and foraging by juvenile salmonids. This will be accomplished by removing the fill and regrading the site to intertidal elevations, reconnecting the site to the river, restoring the natural shoreline, and planting native intertidal and riparian vegetation. As the result of this project, the native habitats and natural processes conducive to the survival of juvenile salmonids would be restored at this site. The resulting intertidal mudflat, salt marsh, and riparian habitats would provide critically important transitional habitat where juvenile salmonids would have the opportunity to feed, rest, and undergo smoltification prior to out-migrating through Puget Sound to the Pacific Ocean. These habitats would also provide important refuge, foraging, and perhaps breeding habitat for a variety of other urban-adapted native fish and wildlife species.

## **1.3 Authority**

Federal involvement in ecosystem restoration is supported in law and Executive Order. The Corps Civil Works Ecosystem Restoration Policy (ER 1165-2-501), the Fish and Wildlife Coordination Act of 1958, Federal Water Project Recreation Act of 1965, National Environmental Policy Act of 1969, Water Resource Development Act (WRDA) of 1986, and the WRDA of 1990 provide national policy directing consideration of projects that benefit ecological resources.

Specifically, Section 306 of the WRDA of 1990 authorized the Secretary of the Army to include environmental protection as one of the primary missions of the Corps. The larger Green/Duwamish Ecosystem Restoration Study stems from the Corps' authority under Section 216 of the River and Harbors and Flood Control Act of 1970, which enables the Corps to undertake restoration related to the hydrologic regime of aquatic ecosystems. Congress specifically authorized the Green/Duwamish River Basin Feasibility Study and thus the North Wind's Weir Intertidal Restoration project, in Section 101(b)(26) of WRDA 2000.

King County DNRP is the non-Federal sponsor for the North Wind's Weir Intertidal Restoration project evaluated in this document. The Corps and King County DNRP have cooperated in regular interagency meetings from which the objectives for the proposed restoration work were developed. King County DNRP has also contributed technical expertise, including design drawings, during plan formulation.

#### **1.4 Associated Studies and Reports**

General information regarding the Green/Duwamish River basin and its associated existing conditions, fish and wildlife populations, and potential impacts on federally listed endangered or threatened species is incorporated into this document by reference to the:

Final Programmatic Environmental Impact Statement and Restoration Plan (FPEIS) for the Green/Duwamish River Basin Ecosystem Restoration Program, prepared by the Seattle District Corps and King County DNRP in November 2000.

Green Duwamish Ecosystem Restoration Study, Final Feasibility Report, prepared by the Seattle District Corps, October 2000.

Programmatic Biological Assessments for Green/Duwamish Ecosystem Restoration Program, King County, Washington. Separate documents were prepared for species under National Marine Fisheries and US Fish and Wildlife jurisdictions for the Seattle District Corps by Jones & Stokes, June 2000.

Seattle's Urban Blueprint for Habitat Protection and Restoration: Review Draft, prepared by the City of Seattle's Salmon Team, June 2001.

Habitat Limiting Factors and Reconnaissance Assessment Report, Green/Duwamish and Central Puget Sound Watersheds (WRIA 9 and Vashon Island), Washington Conservation Commission and the King County Department of Natural Resources, 2000.

Near-Term Action Agenda for Salmon Habitat Conservation, Green/Duwamish River and Central Puget Sound Watershed, Water Resource Inventory Area 9, May 2002.

## **2.0 ALTERNATIVES CONSIDERED**

In order to comply with the National Environmental Policy Act (NEPA), CEQ rules, and Corps regulations, the Corps performed an analysis of potential alternatives to meet the purpose and need of the project. The Corps evaluated the no-action alternative as well as three alternatives for restoration of the site. These alternatives differed in the proportions of the site restored to intertidal mudflat versus marsh elevations, the location and configuration of the connection with the Duwamish River, and the amount and configuration of the natural marsh that could be retained and still allow for tidal connection to the Duwamish River. Ultimately, Alternative 3 was modified to create the Preferred Alternative (Alternative #4). Table 1 lists the goals, objectives, and constraints that were used to develop and assess possible alternatives.

### **2.1 The No-Action Alternative**

Under the no-action alternative, the project area would likely remain undeveloped due to limitations on development encumbered during the purchase of the property by King County DNRP. The site would remain in a disturbed state for many years as pioneering, generally weedy vegetation colonize the compacted soils of the site. An increase in non-native invasive upland shrubs such as Himalayan blackberry and Scot's broom would be expected across the site in the short term, due to the seed sources on and surrounding the property. Herbaceous weeds would also be expected to colonize cleared portions of the site. Over time, the existing trees on the site would continue to grow and shade the edges of the site and young trees could colonize and develop on the site, likely dominated by species such as black cottonwood and red alder that are common in the area and are generally early colonizers of open spaces. The approximately 0.176 acres of existing intertidal salt marsh would continue to fringe the edge of the site and would continue to directly receive storm water discharge from the adjacent industrial facility to the east. Although the site would remain fenced as a barrier to vehicle access, pedestrian access would continue to be unrestricted, and the deposition of refuse and garbage would likely continue.

The no action alternative would not meet the authorized project objectives because no intertidal habitat would be created, no salmonid rearing habitat would be created, and there would be no increase in native plant diversity on the site; thus, the no-action alternative results in much smaller and much lower quality environmental benefits from the site than the other alternatives considered. Furthermore, the no action alternative is not considered to be a less environmentally damaging alternative when compared to the proposed action because existing areas of low-level soil contamination would likely not be removed from the site.

### **2.2 Alternative 1 – Single Entrance Intertidal Marsh**

Under Alternative 1, the majority of the site would be lowered to elevations ranging from +2 to +8 feet NAVD 88 (+4.35 to 10.35 MLLW) and would be connected to the Duwamish River via an entrance off the east side of the rock weir and its associated scour pool. All the existing riprap and abandoned rubble along the shoreline would be removed. This alternative would require grading of the western side of the existing intertidal marsh to match graded contours with existing contours. This alternative would create approximately 1.91 acres of intertidal marsh and a narrow zone of approximately 0.48 acres of intertidal mudflat in the center of the site below approximately the +2 feet contour (NAVD 88). The outer slope of the restored intertidal marsh

would increase in elevation rather quickly along the northern edge and would then transition to approximately 0.54-acres of created forested riparian buffer along the outer edge of the site.

Alternative 1 would result in the loss of the 0.06 acres of the western extent of the existing intertidal marsh (approximately one-third of the marsh) and its replacement with restored intertidal marsh habitat of similar functional value to invertebrates, fish, and birds. The single entrance design would result in a narrow intertidal channel and associated mudflat that would be wetted and accessible to juvenile salmonids.

This alternative was eliminated from further consideration principally due to the low amount of intertidal channel and mudflat that would be restored at the design elevations. In order to maximize the diversity and complexity of foraging, refuge, and resting habitats available for juvenile salmonids, a design with a more balanced proportion of marsh to mudflat and channel habitats was sought.

### **2.3 Alternative 2 – Double Entrance Mudflat**

Under Alternative 2, the majority of the site would be lowered to elevations ranging from –2 feet NAVD 88 to +2 feet NAVD 88 (approx. +0.35 to +4.35 feet MLLW) and would be connected to the Duwamish River in two areas. All the existing riprap and abandoned rubble along the shoreline would be removed. This alternative would require grading across the existing intertidal marsh and mudflat out to the -2-foot elevation contour of the Duwamish River to match graded contours with existing contours. This alternative would create approximately 1.76 acres of intertidal mudflat and a thin fringe of approximately 0.37 acres of marsh at the upper edge of the +2 feet contour (NAVD 88) as it slopes up to the riparian buffer. A forested riparian buffer of approximately 0.36 acres would be restored along the outer edge of the site.

Alternative 2 would result in the complete loss of the 0.176 acres of existing intertidal marsh and its replacement with intertidal mudflat habitat of different functional value to invertebrates, fish, and birds. The double entrance design would result in complex hydraulics as predominately fresh river water entered the restoration site from upstream during normal and high river flows and more estuarine water entered the site on incoming and higher tides. The channel would be accessible to juvenile salmonids during most tidal cycles and from both the upstream and the downstream ends of the project site.

This alternative was eliminated from further consideration due to ecological impacts (including the loss of juvenile salmonid foraging habitat and prey resources) that would result from the complete loss of the existing intertidal marsh. While a fringe of intertidal marsh would be restored around the outer edge of the site, functional replacement of the existing marsh would not be immediately accomplished, nor would there be any guarantee that the restored marsh areas would support the same density and diversity of vegetation as the existing marsh. Consideration of this risk and uncertainty contributed to the elimination of Alternative 2. Uncertainty regarding the hydrodynamics and long-term viability of the created channel, coupled with the ecological impacts of the amount and complexity of excavation necessary to lower the existing mudflat off the northern end of the site to the design elevations between –2 and +2 feet NAVD 88 also contributed to the elimination of Alternative 2 from further consideration.

## **2.4 Alternative 3 – Single Entrance Intertidal Marsh and Mudflat**

Under Alternative 3, the majority of the site would be lowered to elevations ranging from -1 to +4 feet NGVD 88 (+1.35 to 6.35 MLLW) and would be connected to the Duwamish River via an entrance off the east side of the rock weir and its associated scour pool. All the existing riprap and abandoned rubble along the shoreline would be removed. This alternative would require grading of the western side of the existing intertidal marsh to match graded contours with existing contours. This alternative would result in an increase of approximately 0.09 acres of intertidal mudflat over Alternative 2, but with a wider and more gently sloped zone of intertidal marsh than in Alternative 1. Approximately 1.85 acres of mudflat would be created under this alternative, compared to 1.76 acres of mudflat created under Alternative 2. The outer slope of a restored intertidal marsh (of approximately 0.75 acres) would gradually transition to an approximately 0.5-acre restored forested riparian buffer along the outer edge of the site.

Alternative 3 would also result in the loss of the 0.06 acres of the western extent of the existing intertidal marsh (approximately one-third of the marsh) and its replacement with restored intertidal marsh habitat of similar functional value to invertebrates, fish, and birds. The single entrance design under Alternative 3 would result in a broader intertidal channel and larger area of mudflat than under Alternative 2. Thus, more intertidal habitat would be wetted and accessible to juvenile salmonids during a greater portion of the tidal cycle under this alternative.

Based on concerns for the stability of the upstream side of the entrance, this alternative was refined into the Preferred Alternative (described below in Section 3). As a result of refinement of Alternative 3, a small area of armoring and bank stabilization was incorporated into the upstream side of the entrance channel to better maintain the existing hydrodynamics while continuing to maximize the diversity and complexity of habitats available for juvenile salmonids through a balanced proportion of marsh to mudflat and channel habitats. The Preferred Alternative also incorporates techniques to salvage the portion of the existing marsh slated for excavation and replanting the salvaged areas at appropriate elevations within the restored areas of marsh.

## **3.0 DESCRIPTION OF THE PREFERRED ALTERNATIVE:**

### **Single Entrance, Mudflat and Marsh, Armored Upstream Entrance, Salvage Disturbed Portions of Marsh**

#### **3.1 Restoration of Tidal Connectivity and Intertidal Habitats**

Under the Preferred Alternative, the majority of the site would be lowered to elevations ranging from -1 to +4 feet NGVD 88 (+1.35 to 6.35 MLLW) and would be connected to the Duwamish River via an entrance off the east side of the rock weir and its associated scour pool (see Figures 2 through 5). This would create approximately 1.66 acres of tidal channel and associated intertidal mudflat (below elevation +4 NGVD 88) and approximately 0.76 acres of intertidal and high marsh between elevations +4 and +10 feet NGVD 88 (+6.35 and +12.35 MLLW). A scrub-shrub wetland community between elevations +10 and +12 feet NGVD 88 (+12.35 and +14.35 MLLW) of approximately 0.17 acres would gradually transition to a forested riparian buffer encompassing approximately 0.29 acres to the top of the area of excavation. The upstream side of the entrance channel would be armored and bank stabilized to better maintain the existing hydrodynamics of the shoreline, better preserve the undisturbed portion of the existing saltmarsh, and support a self-maintaining channel opening. The top and backside of the armoring would be

capped with soil and planted with vegetation (likely willows) to increase habitat function and improve aesthetics. On in-coming tides, the site would fill with water through the tidal channel, flooding the mudflat and marsh areas. On very high tides, in-coming water would also likely overtop the existing marsh of the site and flood into the site through the restored marsh along the northern edge of the site. On out-going tides, water would flow off of the restored marsh and mudflat and exit the site through the tidal channel. The slopes and elevations are designed for the mudflats and marsh to drain completely at low tides; the tidal channel may retain some ponded water during some of the higher low tides of the year.

Much of the existing riprap and abandoned rubble along the shoreline would be removed and the slope currently colonized by Himalayan blackberries would be excavated and removed. This alternative would require grading of the western side of the existing intertidal marsh to match graded contours with existing contours. The Preferred Alternative would thus result in the loss of the 0.06 acres of the western extent of the existing intertidal marsh (approximately one-third of the marsh) and its replacement with approximately 0.76 acres of restored intertidal marsh habitat that would ultimately be of similar functional value to invertebrates, fish, and birds. Native species planted within the restored marsh area would likely include a variety of species selected for the anticipated tidal regime and salinity conditions of the site, such as Lyngby's sedge (*Carex lyngbyei*), Pacific silverweed (*Potentilla anserine* spp. *pacifica*), hardstem bulrush (*Scirpus acutus*), softstem bulrush (*Scirpus validus*), tufted hairgrass (*Deschampsia cespitosa*), and Douglas aster (*Aster subspicatus*) (Figure 5). Other emergent species may also be considered for the site, such as slough sedge (*Carex obnupta*), small-fruited bulrush (*Scirpus microcarpus*), and spike rush (*Eleocharis* spp.) based on the presence of these species in reference patches of intertidal vegetation along the Duwamish River (Williams et al. 2001).

In order to reduce grazing by geese within the newly planted marsh, a complex of goose excluders will be installed over and around the entire mudflat and marsh areas. Based on designs implemented on other restoration sites along the Duwamish shoreline, the excluders will use open weave steel mesh fencing to prevent 'walk-in' or 'float-in' access and overhead cables to prevent 'fly-in' access to the marsh. The large mesh of the fencing does not restrict access by juvenile salmonids. It is anticipated that these goose excluders will remain in place for a minimum of three years post-planting to allow the restored marsh time to establish and spread sufficiently to withstand herbivory by foraging geese.

In order to minimize the functional and temporal loss of the existing marsh, the portion of the marsh to be graded would be salvaged just prior to grading and replanted within the restoration site at the same elevation. Salvage would be accomplished by cutting the root-mat of the existing marsh into sections, sliding a steel plate under the root-mat, and then lifting out sections of the marsh and its root-mat. The salvaged pieces of marsh would then be transplanted to the appropriate elevation contour in the restored marsh within the same tidal cycle. If possible, the salvaged marsh would be transplanted contiguous with retained areas of the marsh to maximize the likelihood that it would re-root with minimal dieback. The expectation is that much of the relocated marsh would re-root within the restoration area and would thus retain its temporal and functional value to the suite of benthic invertebrates, fish, and wildlife that currently utilize this marsh.

During approximately the first three years post-planting, the scrub-shrub and riparian buffer vegetation would be seasonally irrigated by a temporary, above-ground irrigation system supplied with water from a pumper-truck. The system would be set on a timer to allow for irrigation between May and October of each year. Once the plants are well established (as indicated by reduced mortality rates, evident growth, and the presence of flowers or fruits), the irrigation system would be removed from the site.

### **3.2 Restoration of Habitat Complexity and Functional Benefits**

The Corps and King County DNRP consulted with the Washington Department of Fish and Wildlife (WDFW), Washington Department of Ecology, the US Fish and Wildlife Service (USFWS), NOAA Fisheries, the Muckleshoot Indian Nation, and representatives of WRIA 9 regarding the design of the preferred alternative. The Preferred Alternative incorporates an undulating edge to the elevation contours to increase the habitat complexity and amount of edge habitat at the interface between the mudflat and marsh. In order to increase the functional value of the site for a variety of fish and wildlife species, the Preferred Alternative also incorporates an osprey nesting platform in the southwest corner of the site, nesting boxes suitable to purple martins, native songbirds, and bats, snags erected within the scrub-shrub/forested riparian buffer, and large woody debris placed within the mudflat, marsh, and riparian buffer (Figures 2 and 5). These habitat elements provide a diversity of nesting, foraging, and resting opportunities for wildlife species, and create habitat complexity within the mudflat and marsh areas that is beneficial to juvenile salmonids. Native species planted within the scrub-shrub and forested buffer would include species selected for their fruits, flowers, and berries, including Nootka rose (*Rosa nutkana*), red-osier dogwood (*Cornus sericea*), salmonberry (*Rubus spectabilis*), willow (*Salix* spp.), black twinberry (*Lonicera involucrata*), hawthorn (*Crataegus douglasii*), snowberry (*Symphoricarpos albus*), thimbleberry (*Rubus parviflorus*), Indian plum (*Oemleria cerasiformis*), oceanspray (*Holodiscus discolor*), hazelnut (*Cornus coronata*), big-leaf maple (*Acer macrophyllum*), Douglas-fir (*Pseudotsuga menziesii*), Sitka spruce (*Picea sitchensis*), black cottonwood (*Populus balsamifera*), red alder (*Alnus rubra*), Oregon ash (*Fraxinus latifolia*), and shore pine (*Pinus contorta*) (Figure 5).

### **3.3 Directed Human Access and Passive Recreational Use**

Because this restoration site is located within a highly urbanized area and is adjacent to commercial and industrial work places, the project team expects the restoration site to be an attractive place for local residents/workers to visit for passive recreation. The Preferred Alternative incorporates several design elements intended to minimize the environmental impacts associated with human visitors, while at the same time educating and supporting the existing recreational use of the area (Figures 2, 3, and 5). A crushed rock trail constructed from South 112<sup>th</sup> Street around the outer buffer of the site would direct visitors down to the river's edge while providing them viewing areas to see the restoration site and read interpretive signs. The trail would be accessible to disabled visitors and would incorporate viewing areas edged by split rail fencing and dense, thorny native shrubs such as rose and hawthorn to prevent visitors from accessing the fragile marsh and mudflat habitats in the center of the site. Interpretive signs will educate visitors about the process of restoration and the value of intertidal habitats to a variety of fish and wildlife species. The trail would end at the river's edge with a crushed rock boat ramp suitable for hand-launch crafts such as kayaks and canoes. The incorporation of a hand-launch boat ramp will direct the existing recreational use of the site to an area that will not

impact the restored habitats or disturb wildlife use of the site, while still providing access to the river.

### **3.4 Comparative Environmental Impacts and Benefits**

In comparison to the other alternatives considered, the Preferred Alternative would result in more of the site becoming intertidal mudflat than under Alternative 2, but with a wider and more gently sloped zone of intertidal marsh than in Alternative 1. The single entrance design would result in a broader intertidal channel and larger area of mudflat than under Alternative 2. In contrast to Alternative 3, the armoring and bank stabilization of the upstream side of the entrance channel under the Preferred Alternative would better maintain the existing hydrodynamics of the shoreline to create a self-maintaining opening and to better preserve the undisturbed portion of the existing marsh.

Thus, under the Preferred Alternative, environmental impacts are minimized through efforts to maintain existing hydrodynamics of the river and the incorporation of salvaging efforts to minimize the functional and temporal loss of the existing marsh. Environmental benefits are maximized through the creation of a complex mixture of intertidal channel, mudflat, marsh, and riparian zone that will provide the variety of habitats preferred by juvenile salmonids for foraging, rearing, and refuge over a greater portion of the tidal cycle under this alternative. The complex edge habitat created at the transition between mudflat and marsh and between the marsh and the scrub-shrub/forested riparian zone will similarly net greater environmental benefits for a variety of small mammals, shorebirds, songbirds, and foraging raptors by offering a variety of foraging, nesting, and refuge habitats. The incorporation of an osprey nesting platform, nest boxes, and large woody debris and snags will also increase the habitat complexity and reproductive opportunities for a variety of wildlife species. Benefits to the human environment are also increased under the Preferred Alternative through the incorporation of an accessible trail and viewing platforms and a hand-launch boat ramp.

## **4.0 EXISTING CONDITIONS**

Characteristics of the existing environment have been addressed in detail within a number of documents previously prepared as part of the Green/Duwamish River Basin Restoration Program. Characteristics of the existing environment that are specific to the lower Duwamish River and the proposed project site are described in detail below based on reconnaissance work and review of available documentation. Rather than repeating information for the general Green/Duwamish River system here, that information is incorporated largely by reference to the documents listed below:

Final Programmatic Environmental Impact Statement and Restoration Plan (FPEIS) for the Green/Duwamish River Basin Ecosystem Restoration Program, prepared by the Seattle District Corps and King County DNRP in November 2000.

Programmatic Biological Assessments for Green/Duwamish Ecosystem Restoration Program, King County, Washington. Separate documents were prepared for species under National Marine Fisheries and US Fish and Wildlife jurisdictions for the Seattle District Corps by Jones & Stokes, June 2000.

Seattle's Urban Blueprint for Habitat Protection and Restoration: Review Draft, prepared by the City of Seattle's Salmon Team, June 2001.

Habitat Limiting Factors and Reconnaissance Assessment Report, Green/Duwamish and Central Puget Sound Watersheds (WRIA 9 and Vashon Island), Washington Conservation Commission and the King County Department of Natural Resources, 2000.

Near-Term Action Agenda for Salmon Habitat Conservation, Green/Duwamish River and Central Puget Sound Watershed, Water Resource Inventory Area 9, May 2002.

#### **4.1 Physical Characteristics**

The history and physical characteristics of the Green/Duwamish River basin is described in detail in Sections 3.1 and 3.2 of the FPEIS (USACE and King County DNR 2000). A synopsis of physical characteristics and historic conditions relevant to the proposed restoration project site is presented below.

##### *4.1.1 Green/Duwamish River Basin: Historic Conditions*

The lower Green/Duwamish River estuary was historically an area of very low gradient with a sinuous, meandering main channel. Most of the larger sediment had been deposited in the middle river, and the lower river had primarily sand and mud substrate. Most of the lower reach of the river was affected by tidal influence, whether freshwater tidal or brackish tidal. The Duwamish River had several distributary channels spread over the broad delta floodplain as it emptied into Elliott Bay. Large woody debris was carried into the lower river and estuary from the upper watershed during floods (Perkins 1993, USACE 1997a, 1997b).

The Duwamish River delta at one time was over 4,000 acres of tidal and intertidal habitat (Bloomberg et al. 1988), characterized by a vast, tidally influenced mosaic of swamp and marsh wetlands that supported a large salmon and clam fishery in the Duwamish River and Elliott Bay available to Native Americans before Euro-American settlement.

##### *4.1.2 Green/Duwamish River Basin: Current Conditions*

Over the last 100 years, the braided flows of the lower river have been extensively channelized and reduced to a single permanent channel for much of its length (the Duwamish Waterway) through dredging and filling of river meander channels. Dredging has resulted in the replacement of 9.3 miles of meandering tidal channel habitat with the 5.2 miles of deep channel habitat that exists today (Bloomberg et al. 1988). The consequence on the environment of these actions has been a substantial degradation of the entire ecosystem of the lower Duwamish River and estuary through a combination of levees, severe channelization, water source diversion dams, dams for flood control, and the destruction of nearly all the intertidal habitats in the estuary.

A natural rock weir at approximately river mile 6.2 retards saltwater intrusion into upriver areas except during high tides and low stream flows and creates a small series of rapids on falling tides at this location. This rock weir is locally known as the North Wind's Weir and is located just off the southwestern corner of the project site (Figure 2, Photo 2).

Nearly all intertidal wetlands and shallow subtidal aquatic habitats in the vicinity of Elliott Bay and the lower Duwamish River have been eliminated as a result of urban and industrial development; only about 1 percent of estimated 4,000 acres of tidal and intertidal habitat remains today. In addition to patches of remnant native marsh, a series of ten small intertidal marsh restoration projects have been constructed downstream of the proposed project site since 1995, and one site upstream was constructed in 2003-2004. The existing shoreline banks are thin bands of mud- and sandflats along the toe of riprap.

The lower end of the River (downstream of the project site) is the heavily industrialized portion known as the Duwamish Waterway. The navigation channel is a major shipping route for containerized and bulk cargo with intense marine traffic. The shoreline along the Duwamish Waterway is intensively developed for industrial and commercial operations and the upland areas are heavily industrialized. Upstream of the project site, the Duwamish River similarly contains intense industrial, commercial and residential development along both shorelines.

#### *4.1.3 Geology and Soils*

Due to the degree of dredging, filling, and industrialization of the lower Duwamish River, little is directly known about the native river delta soils. The soils in this area were likely fine materials from alluvium mixed with organic materials from the vast amounts of plant material produced in the estuarine marshes. These soils are generally very deep, poorly drained, and subject to being compacted and destabilized when disturbed (Perkins 1993, USACE 1997a, 1997b).

Due to history of excavation, fill, and varied industrial uses of the project site, the native soil horizon is generally not evident until approximately 14 feet below the existing ground surface. The native soil horizon is generally characterized as a very dark gray to black colored fine sandy loam to silty clay loam overlying an organic rich silty clay loam. From just below the surface to a depth of approximately 14 feet, a mixture of historic fill consisting of steel slag, bricks, and steel debris characterize much of the site.

#### *4.1.4 Hazardous and Toxic Materials*

The Environmental Protection Agency (EPA) is evaluating the sampling record within the lower Duwamish River for designation as a Superfund site on the National Priorities List due to sediment contamination. Sediment sampling within the portion of the Duwamish River downstream of the project site has identified several contaminants of concern, including oil and grease, sulfides, pesticides, polychlorinated biphenyls (PCBs), and polyaromatic hydrocarbons (PAHs) (USACE 1995, 2000d).

The potential for hazardous and toxic materials to enter the Duwamish River and subsequent sediment contamination is of concern in the project area due to the history of industrial development, unregulated discharge of combined sewer overflows, storm water runoff, industrial waste, and large-scale excavation and filling of the shoreline in this area. The development history of the site is summarized in the Phase I Environmental Assessment (Phase I EA), performed for King County DNR by Environmental Associates (2001a). This history indicates use of the site as a former warehouse and former storage and parts salvage yard, with several diesel and gasoline underground storage tanks that were reportedly removed in 1988.

As a supplement to the Phase I EA, subsurface borings were conducted in June 2001 (Environmental Associates, 2001b) to determine if petroleum hydrocarbon, metal, and semivolatile contamination above regulatory levels was present in surface and sub-surface soils. The investigation found that metal and semivolatile concentrations were below Washington Department of Ecology (WDOE) Method A Cleanup criteria. Two locations near the surface (0-5 feet below ground) where there was olfactory evidence of petroleum hydrocarbons were analyzed for NWTPH-Gx (gasoline range) and NWTPH-Dx (diesel and motor oil range). The samples showed NWTPH-Gx of 4-28 parts per million (no benzene detections) and NWTPH-Dx of 160-340 parts per million. A third sample at the same depth interval was analyzed for NWTPH-Dx and was found to have concentrations of 20-86 ppm. All concentrations were below Model Toxics Control Act (MTCA) Level A 2002 cleanup levels (which area: 100 ppm NWTPH-Gx and 2000 ppm NWTPH-Dx).

On June 13, 2003, the Corps and King County DNRP conducted a site investigation designed to collect archeological and geophysical information (Figure 6). Additional information regarding the chemical constituents on the site was also obtained during that investigation (USACE 2003a, 2003b). Copies of the Field Sampling Plan, Final Analytical Services Agreement with Analytical Resources, Inc., the Quality Control Summary Report, and the field results of the June 13, 2003 investigation are available upon request from the Corps.

Petroleum contamination was found in three of the excavations where soil had olfactory and visual signs of petroleum contamination. Samples were collected and benzene, toluene, ethyl benzene, and xylenes (BTEX), total petroleum hydrocarbons (TPH)-gasoline range, TPH-diesel range, and TPH-motor oil range were analyzed with the following summary results:

- a. BTEX: non-detect in all samples
- b. TPH-gasoline range: non-detect in two samples, 10 ppm in the remaining sample, concentrations were below MTCA Level A unrestricted soil cleanup levels (SCL) of 100 ppm
- c. TPH-diesel range: detections in all samples, concentration range 54-1300 ppm. All samples were below the MTCA Level A unrestricted SCL of 2000 ppm. Two samples (460 and 1300 ppm) were above the estimated threshold level (100 ppm) for potential negative effects on juvenile salmon (Kroeger et al., 2001).
- d. TPH-motor oil range: detections in all samples, concentration range 140-2300 ppm, one sample was above MTCA Level A unrestricted (SCLs) of 2000 ppm.

The two samples with the highest TPH-diesel and TPH-motor oil concentrations were analyzed for the presence of hazardous waste constituents. These include polyaromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), and RCRA metals. Total organic carbon levels were also analyzed so results could be normalized for organic carbon to compare against the Washington State Sediment Quality Standards (SQS). This analysis provided the following results:

Polyaromatic hydrocarbons (PAHs)

Seven PAHs were detected. Results as normalized to % carbon were less than the individual and total Washington State PAH Sediment Quality Standards (SQS).

#### Polychlorinated biphenyl's (PCBs)

One PCB was detected. Result as normalized to % carbon was less than the Washington State PCB SQS.

#### RCRA Metals (soil)

Four metals (barium, cadmium, chromium, and lead) were detected. Levels were all below respective Washington State metal SQS.

A hard, porous material, apparently steel slag, was also found in several of the excavations. A Toxicity Characteristics Leaching Procedure (TCLP) for metals was run on the slag to determine if special disposal procedures were necessary. A Synthetic Precipitation Leaching Procedure (SPLP) for metals was also run to determine if the slag posed a threat to ambient water quality. This analysis provided the following results:

Slag TCLP, Metals. All metal TCLP concentrations were below Washington Dept. of Ecology Maximum concentrations for Toxicity Characteristics.

Slag SPLP, Metals. All metal SPLP concentrations were below Washington Dept. of Ecology Ambient Water Quality Criteria.

Based on evaluation of the June 2003 data, there was no evidence that CERCLA hazardous substances were present on the site and therefore, the site was not subject to the restrictions on sponsor/Corps activities described in Regulation 1165-2-132 Hazardous, Toxic, and Radioactive Waste (HTRW) Guidance for Civil Works Projects. The data indicate that the PAHs, PCBs, and metals at the site pose no threat to ambient water quality or native habitat. The data on the slag indicates it is likely that slag does not have to be disposed of as hazardous waste and that the slag is not a threat to ambient water quality or native habitat.

Although petroleum hydrocarbons are present, they are exempt from the definition of "hazardous substances" in CERCLA. However, the petroleum results indicate that soil testing will need to be performed when the soil is excavated during construction to determine what type of disposal is required. Also, the petroleum results indicate soil contaminate levels that are potentially toxic to juvenile fish (Kroeger et al. 2001). The potential toxicity of the petroleum-contaminated soil indicates that it will need to be removed or measures taken to prevent migration of the petroleum to the channel surfaces.

A geophysical survey is also being planned to determine if there are any underground features that may be indicative of potential contamination. If such features are found, they will be removed or remediated in place, along with removal or remediation of any affected soil.

In addition to the soil samples collected in the June 2001 subsurface investigation (Environmental Associates, 2001b), groundwater samples were collected at the bottom of the soil borings. All samples were analyzed for BTEX, NWTPH-gasoline range, NWTPH-diesel range, and NWTPH-motor oil range and two samples were analyzed for arsenic, cadmium, chromium,

and lead. All samples were nondetect in BTEX and NWTPH-gasoline range. All samples were also nondetect or below NWTPH-diesel range and NWTPH-motor oil range WDOE MTCA Method A groundwater cleanup levels. In addition, all metal concentrations were below WDOE MTCA Method A groundwater cleanup levels except one sample where the arsenic concentration was 9.42 micrograms/L. This compares to the WDOE MTCA Method A cleanup level of 5 micrograms/L and the Federal Safe Drinking Water Act Maximum Contaminant Level (MCL) of 10 micrograms/L. The other sample where arsenic was analyzed was non-detect. King County is in the process of reporting the single arsenic exceedance to WDOE to determine if any additional measures need to be taken.

#### *4.1.5 Hydrologic Regime*

Prior to 1900, the Duwamish River estuary was fed by the basin areas of the Cedar, Black, Green and White Rivers, with an undeveloped drainage area of approximately 1,640 square miles. This drainage basin contributed an estimated 2,500 to 9,000 cfs of fresh water to the estuary (Corps 1997a). Diversion of the White, Black, and Cedar Rivers and the construction of Howard Hanson Dam have greatly reduced fresh water input and decreased river flows. A general increase in the distance of saltwater intrusions inland has been documented and is largely attributed to this loss of freshwater flows (from the diversion of the White, Black, and Cedar Rivers) coupled with the regular deepening and channelization that comes with navigation dredging (USACE 1997a).

The Duwamish River is currently fed by runoff from rainfall and groundwater inflows, along with snowmelt from the upper elevations. The tributaries in the basin collect surface waters and route them into the mainstem of the Green River and then downstream into the Duwamish River. Highest flows generally occur in December or January, declining through March with a subsequent snowmelt peak then occurring in April or May. Since construction of the Howard Hanson Dam in 1963, floods have been controlled within the river system, not allowing discharges above the regulated high flow of approximately 12,500 cfs (as measured at the USGS gauge at Auburn). Thus, there is very little difference between the 2-, 5-, 10-, 25-, and 50-year events downstream of the dam, all range between 11,000 to 12,500 cfs. Flood events that inundated the adjacent floodplain no longer occur and large, channel altering flows have an extremely low probability of occurrence (Corps 1997a).

Hydrologic information for the lower Duwamish River is available from a USGS gauge located at the Foster Golf Links golf course in Tukwila Washington (Station No. 12113390) for the period between October 1995 and September 1998. This station is located approximately 4 miles upstream of the project site.

Average discharge for water years 1995 to 1998 is 1,840 cubic feet per second (cfs). Peak stream flows have generally fluctuated between 10,000 and 12,000 cfs, with the maximum discharge was recorded on February 8, 1996 as 13,000 cfs. Characteristic minimum discharges of 247 cfs have been repeatedly recorded during the last weeks of September.

Mean daily stream flow fluctuates on a seasonal basis, with November through February having the highest flows and August through September the lowest flows. January is generally characterized by stream flows between 1,600 and 5,800 cfs; February by flows ranging between

1,400 and 11,000, March through May by flows between 1,500 and 2,800 cfs; June through October by flows between 250 and 800 cfs; October flows between 300 and 2,400; November flows vary between 780 and 8,000 to 12,000 cfs depending on the onset of fall rains, and December flows are between 1,200 and 12,000 cfs.

## **4.2 Water Quality**

The historic and current water quality characteristics of the Green/Duwamish River basin are described in detail in Section 3.4 of the FPEIS (USACE and King County DNR 2000). A synopsis of water quality conditions relevant to the proposed restoration project site is presented below.

Water quality information for the lower Duwamish River is available from a USGS gauge located at the Foster Golf Links golf course in Tukwila Washington (Station No. 12113390) for the period between September 20, 1995 and September 10, 2002. This station is located approximately 4 miles upstream of the project site.

### *4.2.1 Water Quality Class*

The Washington State Department of Ecology is responsible for setting water quality standards for surface waters of the State based on designated water uses and criteria. The waters of the lower Duwamish River from the mouth to river mile 11.0 (the Black River) are designated as Class B waters of the state (Chapter 173-201A-130 WAC). This area encompasses the navigation channel and the entire lower river including the project site.

Pollutants within the Duwamish River are derived primarily from industrial point and non-point sources, storm water runoff, discharges from vessels, and resuspension of contaminated bottom sediments. The Duwamish Waterway (downstream of the project site) remains on the Department of Ecology's 303(d) list of threatened and impaired waters. Listed parameters in this area include a multitude of chemical contaminants including PCB's PAH's, mercury, lead, and arsenic. The enforcement of total maximum daily load limitations and the continual cleanup of the toxic sites along the shoreline is expected to result in additional improvements in water quality.

### *4.2.2 Turbidity*

The highest sources of turbidity within the vicinity of the project site are the periodic pulses of sediment moving downstream within the Duwamish River from seasonal rainfall events. We reviewed water quality sampling gauge data from the U.S. Geological Survey gauge located at the Foster Golf Links golf course in Tukwila Washington (Station No. 12113390) for the period since September 1995. This data indicates that the Duwamish River reaches its maximum suspended sediment levels generally between December and March. Average suspended sediment levels recorded between September 20, 1995 and September 10, 2002 were 48.9 mg/L, including the highest readings of 787 mg/L on February 9, 1996. The Duwamish is also characterized by occasional high levels of suspended sediment occurring during the late spring and even well into the driest portions of the year (274 mg/L on March 19, 1997, 264 mg/L on August 7, 1997, 101 mg/L on March 22, 1998), likely due to intense precipitation from seasonal storm events.

#### *4.2.3 Dissolved Oxygen*

The water quality sampling gauge data (gauge # 12113390) indicates that dissolved oxygen levels in the Duwamish River reach maximum levels generally between mid-December and mid-April. Average dissolved oxygen levels recorded between September 20, 1995 and September 10, 2002 were 10.09 mg/L, including the highest readings of 12.4 mg/L on February 12, 1996. Lowest readings were 7.1 mg/L, recorded on August 16, 2001. Any number of controlled or uncontrolled discharges may exacerbate water quality conditions within the Duwamish River. However, because vertical stratification of Elliott Bay and seasonal periods of low dissolved oxygen are to some extent natural conditions in Elliott Bay and the Duwamish River estuary, local fish populations are presumably adapted to avoid areas of seasonally low dissolved oxygen conditions.

#### *4.2.4 Temperature*

In the lower Duwamish, the relative temperatures of the freshwater inflow and the saltwater intruded from Elliott Bay primarily influence water temperature (Warner and Fritz 1995). This saltwater intrusion profoundly influences water temperature at various depths in the Turning Basin, approximately one mile downstream of the project site (Muckleshoot Indian Tribe Fisheries Department, unpublished data). For example, in January, water temperatures measured at 1-meter depths can increase from 36.5 to 46.8°F over a depth of 26.2 feet. In May, temperature measured at 3.3-foot depths can decrease from 63.9 to 52.9°F measured over a total depth of 13.1 feet. In September, temperatures are more uniform decreasing from 61.9 to 56.8°F. The range of temperatures over depth is also influenced by the tidal stage. The variation in water temperature with depth provides adult and juvenile salmonids some refuge from the higher temperatures. However, in the late summer and early fall, the general range of temperatures offers no refuge from temperatures considered outside the preferred range for sensitive salmonid species. The water quality gauge data (gauge # 12113390) indicates that the Duwamish River has an average temperature of 51°F with a maximum-recorded temperature of 71°F on August 12, 1998 and a minimum temperature of 39°F recorded on February 6, 1997.

Lack of large vegetation in the riparian zone has also been cited as a significant contributor to elevated stream temperatures. Due to the heavy industrialization, there is a near complete lack of riparian trees along the shoreline of the lower Duwamish River. Thus, the contribution of vegetation as an effective buffer against increasing water temperature from direct sun exposure is probably minimal for the action area and the lower Duwamish River on the whole.

### **4.3 Vegetation**

The historic and current characteristic vegetation of the Green/Duwamish River basin are described in detail in Section 3.6 of the FPEIS (USACE and King County DNR 2000). A synopsis of characteristic vegetation communities at the proposed restoration project site is presented below.

#### *4.3.1 Subtidal and Intertidal Vegetation*

There are extremely few areas of naturally occurring intertidal marsh on the lower Duwamish River and no known areas of subtidal vegetation such as eelgrass. Areas of native saltmarsh occur along the western shoreline of the river approximately 1.5 miles downstream of the project

site adjacent to the Hamm Creek restoration site, along the edges of Kellogg Island and at the Herring's House restoration site (approximately 4 miles downstream of the project site), as well as along the western shoreline of the project site. The approximately 0.176 acre saltmarsh adjacent to the project site (Photos 3 and 4) is dominated by Lyngby's sedge (*Carex lyngbyei*) and hard-stem bulrush (*Scirpus acutus*), with scattered patches of Pacific silverweed (*Potentilla anserina* spp. *pacifica*), brass-buttons (*Cotula coronopifolia*), western lilaeopsis (*Lilaeopsis occidentalis*), and fat-hen saltbush (*Atriplex patula*). The upper edges of the marsh also support creeping bentgrass (*Agrostis stolonifera*) and Douglas aster (*Aster subspicatus*) up to the abrupt edge of the rip rapped shoreline that supports a thicket of overhanging Himalayan blackberry (*Rubus discolor*).

The total area of intertidal wetlands and more naturally vegetated shorelines along the lower Duwamish River has increased modestly over the last few years through restoration projects and projects constructed as the result of litigation against the City of Seattle and Metro (currently known as the King County Department of Metropolitan Services) for damage to river habitats from the release of hazardous substances (primarily metals and organic chemicals) from sewer overflows and storm drains. A series of nine small intertidal marsh restorations have been constructed downstream of the project since 1995 and represent nearly the only areas of native intertidal marsh within the lower Duwamish River. The Codiga Farms side channel restoration site is located upstream of the proposed restoration site and is scheduled for completion by the Corps and the City of Tukwila in late 2003.

However, these areas of habitat are isolated (for terrestrial species) by intensive development between patches. The intertidal marshes at these restoration sites are generally dominated by Lyngby's sedge (*Carex lyngbyei*), hard-stem bulrush (*Scirpus acutus*), and common cattail (*Typha latifolia*) with upland buffers that have also been planted with native trees and shrubs as part of the restoration efforts. Agencies and non-profit groups including, but not limited to, the Port of Seattle, King County DNRP, the City of Seattle, the COE, USFWS, and People for Puget Sound are actively monitoring and maintaining many of these areas. These restored areas receive substantial utilization by juvenile salmon, including chinook, and provide important benthic and epibenthic prey resources (e.g., Cordell et al. 1997, 1999). The restoration of these habitats is part of an overall trend toward improvement in the estuary that began with improvements in source control and water quality in the 1970s and continues today.

#### 4.3.2 Riparian and Upland Vegetation

There are virtually no functional riparian communities along the lower Duwamish River, with the exception of Kellogg Island, located approximately four miles downstream of the proposed project site. Scattered patches and individual trees are all that remains of the once diverse riparian forests and tidal swamps that fringed the lower Duwamish River (Bloomberg et al. 1988). Currently, dominant riparian species include black cottonwood (*Populus balsamifera*), Pacific willow (*Salix lucida*), Hooker's willow (*Salix hookeriana*), and red alder (*Alnus rubra*) trees, with understory shrubs dominated by invasive Himalayan blackberry (*Rubus discolor*) and evergreen blackberry (*Rubus laciniatus*) growing out of the rip rapped shorelines.

The uplands surrounding the project site are predominately industrial and commercial facilities (Photo 1). While some of these facilities do support landscaped areas, they are generally not composed on native tree or shrub species and are not maintained as natural areas of habitat.

The Seattle City Light property north of the site is dominated by low-growing, disturbance adapted shrubs and herbaceous species such as bracken fern (*Pteridium aquilinum*) and Himalayan blackberry (*Rubus discolor*) (Photo 1).

The proposed project site is vegetated only along its perimeters (Photos 1 and 3). Invasive Himalayan blackberry (*Rubus discolor*) and evergreen blackberry (*Rubus laciniatus*) dominates the rip rapped shoreline along the western side of the property. A small group of 12- to 18-inch diameter ornamental white poplar trees (*Populus alba*) occur in the southwestern corner of the site and several black cottonwood (*Populus balsamifera*) and red alder (*Alnus rubra*) trees fringe the southern edge of the site (Photo 1). Virtually no understory exists beneath these trees due to the site's history of disturbance.

#### **4.4 Fish**

The historic and current characteristic fish communities of the Green/Duwamish River basin are described in detail in Section 3.5 of the FPEIS (USACE and King County DNR 2000). A synopsis of characteristic fish communities relevant to the Duwamish River within the vicinity of the proposed restoration project site is presented below.

##### *4.4.1 Anadromous Salmonids*

Multiple migratory runs of both native and hatchery reared salmonid stocks occur seasonally in Elliott Bay and the Duwamish River (Warner and Fritz 1995). The use of Elliott Bay by salmonids is believed to be predominantly as a migration corridor. In-migrating adult salmon use deeper areas of Elliott Bay prior to moving into the Duwamish River. However, some rearing and foraging by juvenile salmonids is likely, particularly in the limited shoreline areas with some structural diversity. Returning adult salmon congregate at the mouth of the Duwamish River prior to upstream migration, and juvenile salmonids may use the nearshore reaches Elliott Bay to transition into marine waters.

The Green/Duwamish River system supports a diversity of salmonid species compared to other rivers of this size in the Puget Sound region. There are nine species of anadromous salmonids that have been documented in the Green/Duwamish River: summer/fall chinook salmon, fall run coho salmon, fall run chum salmon, cutthroat, sockeye, and summer/winter steelhead trout, and native char (recently broken into two species - dolly varden (*Salvelinus malma*) and bull trout (*Salvelinus confluentus*). Pink salmon are also present in the system, but generally not in large numbers, perhaps due to the dramatic loss of estuarine and intertidal habitats in the lower Duwamish River. Chinook and chum utilize Elliott Bay and the Duwamish estuary more extensively than other anadromous species (Weitkamp and Schadt 1982; Meyer et al. 1981), especially when congregating at the mouth of the Duwamish River during their adult return. The principal juvenile salmonid out-migration season occurs from mid-April through mid-June for steelhead, coastal cutthroat, coho, and chinook; chum salmon generally out-migrate slightly earlier, between mid-March and early May (Grette and Salo 1986, USACE 1998).

As federally threatened species, the occurrence and potential effects of the proposed project on Puget Sound chinook salmon and Coastal/Puget Sound bull trout are addressed in Section 4.6.

#### *4.4.2 Forage Fish*

Forage fish larvae are ubiquitous in Puget Sound and are a common component of the nearshore plankton. As such, it is difficult to determine the source of this prey item within any given estuary. Very little research has been done to determine if larvae using any given estuary originate in nearby spawning grounds. Intertidal spawning habitat was historically more abundant, however, armoring and other shoreline modifications have limited the amount of available spawning areas.

Forage fish include Pacific herring, surf smelt, and sand lance larvae and juveniles prey on epibenthic invertebrates and crustaceans and are themselves important prey items for larger juvenile salmon and for bull trout. Sand lance is particularly important for juvenile chinook and bull trout. None of these forage fish species spawn within the lower Duwamish River, likely due to the modified shoreline and lack of intertidal gravel and sandy beaches (WDFW PHS database search, June 9, 2003). Fish sampling conducted by USFWS in 2001 captured small numbers (less than ten individuals) of Pacific sand lance at both the Turning Basin and the Hamm Creek estuary restoration sites (Low and Myers 2002).

### **4.5 Wildlife**

The historic and current characteristic wildlife communities of the Green/Duwamish River basin are described in detail in Section 3.7 of the FPEIS (USACE and King County DNR 2000). A synopsis of characteristic wildlife communities relevant to the proposed restoration project site is presented below.

#### *4.5.1 Birds*

The shorelines of and the waters of Elliott Bay provide habitat to a number of terrestrial and water dependent birds. These species include loons, grebes, cormorants, scaups, mergansers, coots, and gulls. The majority of these birds utilize the water column habitats during their respective over wintering periods. These over wintering waterfowl species are generally found in the central Puget Sound region from early November through late April, with the highest concentrations during December through February. The remaining waterfowl are present year-round. Most of the year-round and over wintering species are classified as “divers” and actively pursue pelagic and benthic organisms up to 10 meters or more below the water surface. The horned grebe and red-necked grebe (State Monitor species), as well as the western grebe, Brandt’s cormorant, merlin, and common murre (State Candidate species) and the common loon (State Sensitive species) may also forage over or utilize surface waters of Elliott Bay.

Similarly, abundant waterfowl species also utilize the waters of the lower Duwamish River. Common species include greater scaups, ring-necked ducks, scoters, American wigeons, Canada geese, mallards, common goldeneye, mergansers, and bufflehead. Other common species include western grebes, double-crested cormorants, American coots, pigeon guillemots, and several gull species. Shorebirds observed in the vicinity of the Duwamish waterway have included sandpipers, dunlins, and snipe. These waders are generally present in the tidal mudflats and marshes or along sandy shorelines.

Several other bird species expected to inhabit the affected area are either Federal Species of Concern or are listed by Washington State as Monitor, Candidate, or Sensitive species. The

peregrine falcon (Federal Species of Concern and State Sensitive), osprey (State Monitor), great blue heron (State Monitor), and purple martin (State Candidate) all occur fairly frequently within the area and have been observed utilizing habitats within and along the lower Duwamish River.

Since 1994, a pair of peregrine falcons has been nesting in downtown Seattle, atop the east side of the Washington Mutual Tower. While this pair has not been active at the Washington Mutual site in 2003, the female may be nesting about four blocks away at One Union Square and the male may be nesting with other females either in West Seattle. Peregrine falcons were also reported using a nest box under the West Seattle Bridge just south of Harbor Island in 1999 (Priority Habitat and Species database search June 5, 2003). Peregrine falcons would be expected to hunt waterfowl over Elliott Bay, and to hunt waterfowl and pigeons over the lower Duwamish River and shoreline industrial facilities.

Osprey are frequently seen foraging for fish over Elliott Bay and the lower Duwamish River and appear to be fairly tolerant of human disturbance when choosing nesting locations. Since 1999, osprey nests have been documented on utility poles or other man-made structures in at least three locations within five miles of the project site: on the east side of the Turning Basin, at Terminal 105 (Crowley Marine facility), and at Terminal 18 on Harbor Island (Priority Habitat and Species database search June 5, 2003). A pair of osprey fledged two chicks in 2003 from a nest atop a constructed nesting platform approximately 1.5 miles downstream of the project site at the Hamm Creek restoration site.

Similarly, great blue herons are also frequently seen wading within the lower Duwamish River and its remaining intertidal habitats. Three heron rookeries have been documented within the vicinity of the proposed project: approximately five miles downstream of the site on the forested slope west of Terminal 105 (nests unoccupied in 2000), the Black River rookery approximately three miles southeast has been active since 1985, and the Seahurst park rookery has been active since 1981 approximately 2.5 miles southwest of the site (Priority Habitat and Species database search June 5, 2003).

A purple martin nest was noted in 1979 within the Bon Marche parking garage in downtown Seattle (Priority Habitat and Species database search June 5, 2003). In recent years, private individuals have erected nest boxes around Puget Sound and the lower Duwamish River and these boxes have successfully attracted nesting purple martins. As of June 2003, ten pairs are nesting in Jack Block Park on the west side of Harbor Island, a pair is nesting at Kellogg Island, and one to two pairs are nesting at Terminal 105. There are currently no nest boxes erected further upstream (i.e. toward the project site) than the Terminal 105 site (Kevin Lee, personal communication, June 9, 2003).

As federally threatened species, the occurrence and potential effects of the proposed restoration project on bald eagles, spotted owls, and marbled murrelets are addressed in Section 4.6.

#### *4.5.2 Marine Mammals*

Harbor seals and Dall's porpoise are known to frequently forage in Elliott Bay and are both State Monitor Species (Calambokidas 1991). Harbor seals are also common within the lower Duwamish River where they forage for fish. Similarly, orca whales and Pacific harbor porpoise

are also common within Elliott Bay; Pacific Harbor porpoise is a State Candidate Species (Calambokidas 1991), and the southern resident distinct population segment of orca whales was recently listed as a federally threatened species (70 FR 69903). California gray whales, Pacific harbor porpoise, and California sea lions are also common inhabitants of the area. Harbor porpoise and harbor seals are year-round residents. California sea lions may utilize waters of Elliott Bay in the winter to feed on migrating salmon and steelhead trout (Pfeifer 1991). Both harbor seals and California sea lions have been seen hauled out on floats and navigation buoys moored within Elliott Bay.

Stellar sea lion, the southern resident distinct population segment of killer whale, and humpback whale are the only marine mammal species potentially within the action area that are federally proposed or listed as threatened or endangered species and as such, are addressed in Section 4.6 below.

#### *4.5.3 Amphibians, Reptiles, and Terrestrial Mammals*

Due to its highly developed and disturbed character, only a few disturbance-tolerant amphibians, reptiles, or terrestrial mammals would be expected to occur within or around the proposed restoration site. Adult tree frogs and garter snakes may occur within the power line corridor to the north of the site. Raccoons, opossums, rats, mice, and voles may inhabit the remnant patches of riparian trees and blackberries that fringe the lower river and the southern edge of the site.

### **4.6 Threatened and Endangered Species**

The potential occurrence of federally listed threatened and endangered species within the Green/Duwamish River basin are described in detail in Section 3.7.2 of the FPEIS (USACE and King County DNR 2000). A synopsis of this information relevant to the proposed restoration project site is presented below.

In accordance with Section 7(a)(2) of the Endangered Species Act of 1973, as amended, federally funded, constructed, permitted, or licensed projects must take into consideration impacts to federally listed and proposed threatened or endangered species. The Corps prepared two Programmatic Biological Assessments (BA) to assess potential impacts of the proposed work on species protected under the Act, one for species under the jurisdiction of the USFWS and one for species under the jurisdiction of NOAA Fisheries. Those BAs covered the federally listed threatened or endangered species listed in Table 2. Only the bald eagle, chinook salmon, and bull trout occur within the vicinity of the North Wind's Weir restoration site. Copies of the Programmatic Biological Assessments are available from the Corps upon request.

However, since the original BAs were completed, the Puget Sound Southern Resident distinct population segment of killer whales, also known as orcas, has been listed as an endangered species, and critical habitat has been designated for Puget Sound Chinook salmon and Coastal/Puget Sound bull trout.

#### *4.6.1 Puget Sound Southern Resident Distinct Population Segment of Killer Whales*

The Southern Resident distinct population segment (DPS) of killer whales, also known as orcas, was designated as a federally endangered species on November 18, 2005 by the NOAA Fisheries

Service (70 FR 69903). Southern Resident orcas in the eastern North Pacific occupy the California Current ecosystem and range throughout the inland waterways of Puget Sound, the Strait of Juan de Fuca, and the Southern Georgia Strait during the spring, summer, and fall. They have also recently been documented in the coastal waters off Oregon, Washington, Vancouver Island, and the Queen Charlotte Islands. Little is known about the winter range and movements of the Southern Resident orcas which occur in large, stable groups (pods) with a matrilinear social structure. The Southern Resident population contains three pods, J Pod, K Pod, and L Pod. During non-summer months, J pod is sighted more frequently in Puget Sound than the other two pods (Wiles 2004). Southern Resident orcas feed primarily on fish, particularly on Chinook salmon.

#### *4.6.2 Puget Sound Chinook Salmon Critical Habitat*

On September 2, 2005, NOAA Fisheries designated critical habitat areas in Washington, Oregon, and Idaho for 12 Evolutionarily Significant Units (ESU) of west coast salmon and steelhead listed as threatened and endangered under the ESA (70 FR 52630). Critical habitat for the Puget Sound Chinook salmon Evolutionarily Significant Unit (ESU) has been designated in the action area. As designated, Chinook salmon critical habitat within this system is defined as the lateral extent of the width of the stream channel as defined by its bankfull elevation. If the bankfull elevation is not evident on either bank, the Ordinary High Water Line (OHWL), as defined by the U.S. Army Corps of Engineers, would be used to determine the lateral extent of critical habitat. In streams or areas where the OHWL is not defined, the width of the stream will be defined by the bankfull elevation (69 FR 74584).

Adjacent floodplains are not included as critical habitat, although it is recognized that the quality of aquatic habitat within stream channels is intrinsically related to the character of the floodplains and associated riparian zones, and that human activities that occur outside the river channels can have demonstrable effects on physical and biological features of the aquatic environment (69 FR 74584).

#### *4.6.3 Coastal/Puget Sound Bull Trout Critical Habitat*

On September 26, 2005, the U.S. Fish and Wildlife Service designated critical habitat in Washington, Oregon, Idaho, and Montana for bull trout, including the Coastal/Puget Sound bull trout population (70 FR 56212). Designated critical habitat for bull trout includes the Duwamish River. As designated, bull trout critical habitat within this system is defined as the lateral extent of the width of the stream channel as defined by its bankfull elevation. If the bankfull elevation is not evident on either bank, the OHWL, as defined by the U.S. Army Corps of Engineers, would be used to determine the lateral extent of critical habitat (69 FR 35782).

Adjacent floodplains are not designated as critical habitat, although it is recognized that the quality of aquatic habitat within stream channels is intrinsically related to the character of the floodplains and associated riparian zones, and that human activities that occur outside the river channels can have demonstrable effects on physical and biological features of the aquatic environment (69 FR 35782).

#### **4.7 Cultural Resources**

The cultural and historic resources of the Green/Duwamish River basin are described in detail in Section 3.16 of the FPEIS (USACE and King County DNR 2000). Site-specific information is presented below. The project area is situated on the banks of the Duwamish River adjacent to a stretch of low tide rapids with a deep pool below. This location would have been a prime fishing site for Native Americans and the adjacent shores are considered likely to contain evidence related to this activity. However, the apparent removal of native soils and the placement of deep fill in the project area would have removed all potential archaeological deposits in the upper soil profile.

Section 106 of the National Historic Preservation Act of 1966, as amended, requires that Federal agencies identify and assess the effects of Federally assisted undertakings on historic properties and to consult with others to find acceptable ways to resolve adverse effects. Properties protected under Section 106 are those that are listed on or eligible for listing on the National Register of Historic Places (NRHP). Eligible properties must generally be at least 50 years old, possess integrity of physical characteristics, and meet at least one of four criteria for significance. Regulations implementing Section 106 (36 CFR Part 800) encourage maximum coordination with the environmental review process required by the National Environmental Policy Act (NEPA) and with other statutes. The Washington State Archaeological Sites and Resources Act (RCW 27.53) and the Indian Graves and Records Act (RCW 27.44) may also apply.

Cultural resources studies related to this project are being conducted by a Corps archaeologist separately from the NEPA process. These studies are part of the National Historic Preservation Act of 1966, as amended (NHPA), Section 106 compliance process for the project. Studies completed to date include an examination of the archaeological and historical site records at the Washington State Office of Archaeology and Historic Preservation (OAHP), a pedestrian reconnaissance survey of the project area, and the excavation of backhoe trenches. The records search indicated that no properties listed on the National Register of Historic Places (NRHP) or the state listing are located within the proposed project area. Background research indicated that a Native American legendary location may be situated adjacent to the project area and research on this subject is continuing. Due to the presence of imported fill covering the project area, backhoe trenches were excavated to determine if subsurface archaeological deposits were present below the fill (Figure 6). The backhoe testing indicated that the upper levels of native soils within the project area were removed sometime in the past and the area covered with imported fill of varying characteristics. The extreme depth of the fill greatly reduces the possibility that any of the proposed alternatives could affect buried archaeological deposits. The results of the Section 106 cultural resource investigation and a determination of the project's potential affects to historic properties will be reported in a separate document that will be submitted to the State Historic Preservation Officer (SHPO) for review.

#### **4.8 Native American Concerns**

The cultural and historic resources of the Green/Duwamish River basin are described in detail in Section 3.16 of the FPEIS (USACE and King County DNR 2000). Site-specific information is presented below. The project area is situated within the usual and accustomed fishing and shellfish harvesting areas of the Muckleshoot Indian Tribe on the Duwamish River. The tribe

historically and presently harvests salmon and shellfish from the lower river. Gill-netting for salmon occurs within the river just downstream of the project site.

#### **4.9 Land Use**

The historic and current land and shoreline use of the Green/Duwamish River basin are described in detail in Section 3.11 of the FPEIS (USACE and King County DNR 2000). A synopsis of site-specific information relevant to the proposed restoration project site is presented below.

The lower end of the River (downstream of the Turning Basin and the North Wind's Weir restoration site) is the heavily industrialized portion known as the Duwamish Waterway. The shoreline along the Waterway is intensively developed for industrial and commercial operations and the upland areas are similarly heavily industrialized by a variety of water dependent industrial users. Beginning just downstream of the project site and continuing to the mouth, over-water structures (such as piers and docks) occupy 12,150 linear feet (2.3 miles) on both banks of the river. This represents about 20 percent of the lower estuarine shoreline (King County DNR 2001). As a major shipping route for containerized and bulk cargo, the navigation channel is subject to intense marine traffic, in addition to recreational boaters and other river users.

Upstream of the North Wind's Weir restoration site, the shoreline and uplands are similarly developed with intense industrial, commercial and residential development. Large land users include The Boeing Company, the King County Regional Airport (Boeing Field), and the Museum of Flight.

#### **4.10 Recreation**

The historic and current land and shoreline use of the Green/Duwamish River basin are described in detail in Section 3.12 of the FPEIS (USACE and King County DNR 2000). A synopsis of site-specific information relevant to the proposed restoration project site is presented below.

The Green/Duwamish River Trail runs along the western side of the Duwamish River, beginning approximately one mile downstream of the proposed restoration site. The trail supports day-use recreation such as jogging and biking by local residents and workers. The 3-acre Cecil Moses Memorial County Park is located along the trail, directly across the river (to the west) from the proposed restoration site. The park includes an intertidal restoration site as well as landscaping and bathroom facilities. It also supports day-use by local area workers and is connected to the east side of the river by a footbridge extending over the river approximately 500 feet downstream of the proposed restoration site.

The rock weir located just off the western edge of the property attracts kayakers to the rapids that form as the river cascades over the rocks (Photo 2). Birdwatchers and people interested in watching the kayakers and the rapids can view the river from the footbridge.

#### **4.11 Air Quality and Noise**

Information characterizing the air quality and noise levels within the Green/Duwamish River basin is described in detail in Sections 3.8 and 3.9 of the FPEIS (USACE and King County DNR

2000). A synopsis of current site-specific information relevant to the proposed restoration project site is presented below.

The Puget Sound region has been an attainment area for carbon monoxide since October 11, 1996; the Seattle-Tacoma area has been an attainment area for ozone since November 25, 1996. As of May 14, 2001, the Seattle, Tacoma, Kent areas were classified as attainment areas for particulate matter (PM10) pollution (J. Anderson, Puget Sound Clean Air Agency, pers. comm. October 22, 2003 via email). Thus, the project area is within attainment areas for all criteria pollutants. The reductions in PM10 pollution that led to attainment status are a result largely of changes enacted by the legislature in the 1991 Clean Air Washington Act (Puget Sound Clean Air Agency website: [http://www.pscleanair.org/news/2001/05\\_14\\_epa.shtml](http://www.pscleanair.org/news/2001/05_14_epa.shtml)). Those changes tightened up emission standards for wood stoves and fireplaces, prohibited outdoor burning in urban areas, and authorized an inspection program for diesel trucks and buses, which was implemented by the Department of Ecology. In addition, a partnership between the Clean Air Agency and the Northwest Hearth Products Association encouraged people to trade out their old wood stoves and fireplaces for cleaner natural gas, propane, pellet or EPA-certified models.

#### **4.12 Transportation**

Information characterizing traffic and transportation within the Green/Duwamish River basin is described in detail in Section 3.10 of the FPEIS (USACE and King County DNR 2000). A synopsis of site-specific information relevant to the proposed restoration project site is presented below.

Traffic within the vicinity of the proposed restoration site occurs primarily along East Marginal Way, Tukwila International Boulevard, and the South Boeing Access Road to the east of the site and along West Marginal Way and Highway 99 across the river and to the west of the project site. Traffic volumes are highest during peak commuting hours, but are sustained throughout the day by changes in shifts at the Boeing facilities, tourism to the Museum of Flight, traffic related to Boeing Field, and the movement of tractor-trailers and other commercial vehicles along the Duwamish corridor to Harbor Island and the Port of Seattle. While South 112<sup>th</sup> Street borders the southern property boundary, the street supports only local traffic into and out of the adjacent commercial facilities.

#### **4.13 Aesthetics**

Information characterizing visual quality and aesthetic resources within the Green/Duwamish River basin is described in detail in Section 3.13 of the FPEIS (USACE and King County DNR 2000). A synopsis of site-specific information relevant to the proposed restoration project site is presented below.

Due to its highly developed and industrialized location, the visual and aesthetic resources of the project site are limited. The rock weir, footbridge over the Duwamish River, and the Cecil B. Moses County Park are visible to the west/southwest of the site and provide limited areas of increased visual quality. From the footbridge, upstream and downstream portions of the river are visible and provide limited bird and marine mammal watching opportunities. The rock weir is visible for much of the tidal flux of the river and the rapids produced as the river flows over the rocks provides visual interest and attracts kayakers to this portion of the river (Photo 2).

## **5.0 ENVIRONMENTAL EFFECTS OF THE PREFERRED ALTERNATIVE**

The effects of the proposed project are compared against the baseline conditions associated with the no-action alternative.

### **5.1 Physical Characteristics**

#### **5.1.1 River Basin**

Information describing the environmental effects on the Green/Duwamish River basin is presented in Section 4.4 of the FPEIS (USACE and King County DNR 2000). A synopsis of site-specific information relevant to the proposed restoration project site is presented below.

##### ***No Action Alternative***

Under the No Action Alternative, there would be no change to the current conditions of the Green/Duwamish River basin. The project site would remain undeveloped and largely dominated by invasive, non-native herbs and shrubs, with the progressive colonization of trees such as red alder and black cottonwood.

##### ***Preferred Alternative: Single Entrance, Mudflat and Marsh, Armored Upstream Entrance, Salvage Disturbed Portions of Marsh***

Under the Preferred Alternative, the current condition of the Green/Duwamish River basin would be improved by the restoration of the project area to intertidal elevations and intertidal and riparian native plant communities. This would create approximately 1.66 acres of tidal channel and associated intertidal mudflat and approximately 0.76 acres of intertidal and high marsh. A scrub-shrub wetland community of approximately 0.17 acres would gradually transition to a forested riparian buffer encompassing approximately 0.29 acres to the top of the area of excavation. While the Preferred Alternative would result in the loss of the 0.06 acres of the existing intertidal marsh, the disturbed portions of the marsh would be salvaged and replaced by the restored intertidal marsh habitat that would ultimately be of similar functional value to invertebrates, fish, and birds.

#### **5.1.2 Geology and Soils**

Information describing the environmental effects on the geology and soils of the Green/Duwamish River basin is presented in Section 4.4.1 of the FPEIS (USACE and King County DNR 2000). A synopsis of site-specific information relevant to the proposed restoration project site is presented below.

##### ***No Action Alternative***

Under the No Action Alternative, there would be no change to the current conditions of the geology or soils within the project site. The layers of fill, steel slag, bricks, and industrial debris that currently encompass the soil horizons of the site, as well as the riprapped shoreline, would remain in place.

##### ***Preferred Alternative: Single Entrance, Mudflat and Marsh, Armored Upstream Entrance, Salvage Disturbed Portions of Marsh***

Under the Preferred Alternative, the mixture of historic fill, steel slag, bricks, steel debris, and shoreline riprap that characterize the site would be excavated, removed from the site, and properly disposed of at approved landfill facilities. This would improve the soil conditions of the site and would eliminate approximately 234 lineal feet of armored shoreline, as well as 2 to 3 acres of industrial fill and associated chemical constituents from the shoreline of the lower Duwamish River. Approximately 300 cubic yards of riprap/angular rock would be placed as bank armoring along the upstream slope of the entrance channel to stabilize the entrance slope and to prevent changes in the existing split in river flow over the rock weir.

#### *5.1.3 Hazardous and Toxic Materials*

Information describing the environmental effects on hazardous and toxic materials of the Green/Duwamish River basin is presented in Section 4.4.2 of the FPEIS (USACE and King County DNR 2000). A synopsis of site-specific information relevant to the proposed restoration project site is presented below.

##### ***No Action Alternative***

Under the No Action Alternative, there would be no change to the current extent and character of the hazardous and toxic materials noted at the project site. The layers of fill, steel slag, bricks, and industrial debris that currently encompass the soil horizons of the site, as well as the riprapped shoreline, would remain in place. There would be no cleanup of the hydrocarbon contamination of the soils on site, removal of any underground objects and/or associated contamination, or any measures implemented with respect to arsenic in the groundwater.

##### ***Preferred Alternative: Single Entrance, Mudflat and Marsh, Armored Upstream Entrance, Salvage Disturbed Portions of Marsh***

Under the Preferred Alternative, the layers of fill, steel slag, bricks, industrial debris, and areas of hydrocarbon contamination, as well as the riprapped shoreline, would be removed from the site and properly disposed of at approved facilities. This would improve the conditions of the site and would eliminate approximately 2 to 3 acres of industrial fill and associated chemical constituents from the shoreline of the lower Duwamish River.

The petroleum-contaminated soil would be removed or isolated from contact with or migration to surfaces of the fish channel. Any underground objects and associated contamination would be removed. Any measures that are necessary to take with respect to the arsenic in the groundwater would be performed.

#### *5.1.4 Hydrologic Regime*

Information describing the environmental effects on the water resources of the Green/Duwamish River basin is presented in Section 4.5 of the FPEIS (USACE and King County DNR 2000). A synopsis of site-specific information relevant to the proposed restoration project site is presented below.

##### ***No Action Alternative***

Under the No Action Alternative, there would be no change in the discharge or daily stream flows in the lower Duwamish River.

***Preferred Alternative: Single Entrance, Mudflat and Marsh, Armored Upstream Entrance, Salvage Disturbed Portions of Marsh***

Under the Preferred Alternative, the entrance to the restored intertidal areas would allow rising tides and river stages to flow from the main channel into the restoration site, filling the site on incoming tides and draining the site on outgoing tides. This would not result in a measurable change in the discharge or daily stream flows in the lower Duwamish River.

## **5.2 Water Quality**

Information describing the environmental effects on the water quality of the Green/Duwamish River basin is presented in Section 4.6 of the FPEIS (USACE and King County DNR 2000). A synopsis of site-specific information relevant to the proposed restoration project site is presented below.

### ***5.2.1 Water Quality Class***

***No Action Alternative***

Under the No Action Alternative, there would be no change in the water quality classification as ‘aquatic life use’ for “salmon and trout rearing and migration only” (WAC 173-201A-600, 602). Similarly, there would be no change to the pollutants within the Duwamish River nor in its listing on the Department of Ecology’s 303(d) list of threatened and impaired waters.

***Preferred Alternative: Single Entrance, Mudflat and Marsh, Armored Upstream Entrance, Salvage Disturbed Portions of Marsh***

Under the Preferred Alternative, there would also be no change in the water quality classification as ‘aquatic life use’ for “salmon and trout rearing and migration only” (WAC 173-201A-600, 602). However, restoration of intertidal habitats within the project site and reconnection of the project site with the Duwamish River will improve rearing and foraging conditions for juvenile salmonids by increasing the area of intertidal mudflat and saltmarsh that support the benthic and epibenthic food web on which juvenile salmonids depend. Similarly, while there would be no change to the listing of the Duwamish River on the Department of Ecology’s 303(d) list of threatened and impaired waters as result of this project, excavation and proper disposal of the fill material from the project site will incrementally reduce the pollutant load to the Duwamish River improving its water quality.

### ***5.2.2 Turbidity***

***No Action Alternative***

Under the No Action Alternative, there would be no change in the characteristic turbidity of the Duwamish River because there would be no change to the shoreline armoring and no grading taking place at the project site.

***Preferred Alternative: Single Entrance, Mudflat and Marsh, Armored Upstream Entrance, Salvage Disturbed Portions of Marsh***

Under the Preferred Alternative, there would be small-scale, temporary increases in turbidity within the river channel as a result of construction activities to remove the shoreline riprap, armor and stabilize the upriver side of the entrance channel, and during the grading necessary to salvage portions of the native marsh and connect the intertidal channel to the river. In order to reduce temporary increases in turbidity and potential related effects on juvenile salmonids in the river, all ‘in-water’ construction work will take place during the appropriate fish window

(August 1 to August 31, or as otherwise determined by WDFW) and will take place during the lowest portions of the tidal cycle. Construction techniques, sequencing, and timing will minimize soil disturbance to the extent practical to minimize the generation of turbidity during connection of the tidal channel to the Duwamish River. Similarly, the design and implementation of the erosion-control and the Storm Water Pollution Prevention (SWPPP) plans will incorporate best management practices (BMPs) to further reduce the duration and magnitude of the temporary increases in turbidity. Because such increases will occur only during the portions of the construction sequence that require 'in water' work, turbidity impacts will be localized and temporary, and are expected to return to normal levels as soon as 'in-water' construction activities are completed. Turbidity monitoring during construction will ensure that these temporary increases are in compliance with State Water Quality Conditions.

Ultimately, by removing compacted surface fill and restoring tidal connectivity and native plant communities to the project site, the Preferred Alternative will incrementally improve the filtration of overland flow and will reduce stormwater runoff from the site into the Duwamish River.

### *5.2.3 Dissolved Oxygen*

#### ***No Action Alternative***

Under the No Action Alternative, there would be no change in the characteristic dissolved oxygen levels in the Duwamish River because there would be no change to shoreline vegetation and no grading taking place at the project site.

#### ***Preferred Alternative: Single Entrance, Mudflat and Marsh, Armored Upstream Entrance, Salvage Disturbed Portions of Marsh***

Under the Preferred Alternative, there could be small-scale, temporary decreases in dissolved oxygen within the river channel as a result of increases in turbidity related to construction activities to remove the shoreline riprap, armor and stabilize the upriver side of the entrance channel, and during the grading necessary to salvage portions of the native marsh and connect the intertidal channel to the river. In order to reduce temporary decreases in dissolved oxygen and potential related effects on juvenile salmonids in the river, all 'in-water' construction work will take place during the appropriate fish window (August 1 to August 31, or as otherwise determined by WDFW) and will take place during the lowest portions of the tidal cycle. Construction techniques, sequencing, and timing will minimize soil disturbance to the extent practical to minimize the generation of turbidity (and consequent reduction in dissolved oxygen concentrations) during connection of the tidal channel to the Duwamish River. Similarly, the design and implementation of the erosion-control and the Storm Water Pollution Prevention (SWPPP) plans will incorporate best management practices (BMPs) to further reduce the duration and magnitude of the temporary increases in turbidity and potential impacts of dissolved oxygen levels. Because such decreases might occur only during the portions of the construction sequence that require 'in water' work, any reduction in dissolved oxygen will be localized and temporary, and would be expected to return to normal levels as soon as 'in-water' construction activities are completed. Monitoring of water quality conditions during construction will ensure that these temporary decreases are in compliance with State Water Quality Conditions.

### *5.2.4 Temperature*

#### ***No Action Alternative***

Under the No Action Alternative, there would be no change in the characteristic temperature profile of the Duwamish River because there would be no change to overhanging shoreline vegetation.

***Preferred Alternative: Single Entrance, Mudflat and Marsh, Armored Upstream Entrance, Salvage Disturbed Portions of Marsh***

Under the Preferred Alternative, the existing rip rapped shoreline armoring and thicket of blackberries would be removed and replaced with intertidal mudflat and saltmarsh fringed by native riparian plantings. As the approximately 0.47 acres of riparian buffer develops, the trees along the riverward edge of the project would ultimately provide some shade to the river banks and would incrementally benefit water temperature conditions in the river channel. In addition, the incorporation of large woody debris into the intertidal areas of the site will also provide localized areas of temperature refuge for foraging salmonids utilizing the restoration site.

### **5.3 Vegetation**

Information describing the environmental effects on vegetation in the Green/Duwamish River basin is presented in Section 4.8 of the FPEIS (USACE and King County DNR 2000). A synopsis of site-specific information relevant to the proposed restoration project site is presented below.

#### ***5.3.1 Subtidal and Intertidal Vegetation***

***No Action Alternative***

Under the No Action Alternative, there would be no change in the existing extent or configuration of the intertidal saltmarsh adjacent to the western edge of the property. It is anticipated that this marsh would continue to provide a source of ecological data for the various Federal and State agencies that utilize it as a reference site.

***Preferred Alternative: Single Entrance, Mudflat and Marsh, Armored Upstream Entrance, Salvage Disturbed Portions of Marsh***

Under the Preferred Alternative, there would be an increase in the extent and species diversity of intertidal mudflat and saltmarsh on the restoration site. The existing rip rapped shoreline armoring and thicket of blackberries would be removed and replaced with intertidal mudflat and saltmarsh fringed by native riparian plantings. Approximately 1.66 acres of the site would become intertidal mudflat, fringed by an approximately 0.76-acre band of intertidal and high marsh that would gradually transition to a scrub-shrub and forested riparian buffer. While the Preferred Alternative would result in the loss of the 0.06 acres of the existing intertidal marsh (Photo 4), the disturbed portions of the marsh would be salvaged and replaced by the restored intertidal marsh habitat that would ultimately be of similar functional value to invertebrates, fish, and birds (Photo 3). The remaining portions of the existing saltmarsh would still be accessible to researchers as a reference site and the salvaged portions of the marsh would also provide data to researchers on the degree and nature of changes to stem density, species diversity, and characteristic invertebrate populations after the salvaged portions have been relocated to suitable elevations within the restoration site. The salvaged portions would also be available for comparisons to the development of the planted marsh vegetation and as a seed source for the natural spread of intertidal marsh within the restoration site.

### *5.3.2 Riparian and Upland Vegetation*

#### ***No Action Alternative***

Under the No Action Alternative, the existing trees on the site would remain and the site would likely continue to recruit limited patches of invasive and weedy herbaceous species on the areas that are not covered with debris. Over time, the site would be expected to recruit trees such as black cottonwood and red alder, but these plants would be unlikely to recruit into the river due to the isolation of the river from its floodplain in this developed area. Thus, there would be largely no change in the existing extent or species diversity of riparian or upland vegetation along the Duwamish River.

#### ***Preferred Alternative: Single Entrance, Mudflat and Marsh, Armored Upstream Entrance, Salvage Disturbed Portions of Marsh***

Under the Preferred Alternative, there would be an increase in the extent and species diversity of riparian and upland vegetation on the restoration site. While a few of the existing trees in the center of the site would be removed (and retained as large woody debris), approximately 0.47-acres of scrub-shrub and forested riparian buffer would be created around the outer edge of the site. The upland trees along the southern and eastern sides of the property would be retained to the extent possible and their understory would be planted with native upland shrubs to further increase the species richness and habitat value of the site (Photo 1).

### **5.4 Fish**

Information describing the environmental effects on the fisheries resources of the Green/Duwamish River basin is presented in Section 4.7 of the FPEIS (USACE and King County DNR 2000). A synopsis of site-specific information relevant to the proposed restoration project site is presented below.

#### *5.4.1 Anadromous Salmonids*

#### ***No Action Alternative***

Under the No Action Alternative, there would be no change to the site that would affect anadromous salmonids in the Duwamish River. The small area of existing intertidal saltmarsh would remain as foraging and refuge habitat for juvenile salmonids in the river.

#### ***Preferred Alternative: Single Entrance, Mudflat and Marsh, Armored Upstream Entrance, Salvage Disturbed Portions of Marsh***

Under the Preferred Alternative, there would be an increase of 1.66 acres of intertidal mudflat and an increase of 0.76 acres of intertidal saltmarsh created as a result of this restoration project. These habitats would directly increase foraging habitat for juvenile salmonids in the lower Duwamish River by increasing habitat for the benthic and epibenthic invertebrates that juvenile salmon feed on. Similarly, removal of the existing rip rapped shoreline and the addition of a planted riparian buffer would contribute to an increase in the functional value of the site for exporting organic material and littoral insects into the food web of juvenile salmonids. In addition, creation of accessible intertidal habitat within this specific reach of the lower Duwamish will also benefit juvenile salmonids by providing habitat at the upper edge of the salt wedge for their physiological transition to life in salt water.

Water quality impacts such as increased turbidity and decreased dissolved oxygen during the periods of 'in-water' work could reduce the suitability of the eastern shoreline of the Duwamish River for salmonids during construction, but this effect would be temporary and localized. All 'in-water' work would be conducted within the fish window of August 1 to August 31. Avoiding 'in-water' work during peak salmonid out migration periods (generally between February 15 and July 15) would minimize the short-term effects of the Preferred Alternative on juvenile salmonids. This timing would also avoid noise impacts to juvenile salmonids.

There would be a temporary decrease in benthic and epibenthic invertebrates within the portion of the existing salt marsh that is excavated during connection of the tidal channel to the Duwamish River. However, the small area of impact would be regraded to intertidal elevations and as such is expected to be quickly recolonized by invertebrates from adjacent undisturbed areas. Similarly, the 'in water' excavation and grading will take place soon after the mid-July end of the juvenile salmonid outmigration period (i.e. beginning in early August). This schedule will allow for maximum recovery of the benthic and epibenthic communities prior to the subsequent year's juvenile salmonid outmigration period.

Such temporary impacts are limited in time to periods outside the fish window and are limited in space to the immediate vicinity of construction activities that need to take place below mean higher high water. As such, they are not expected to have significant or long-term impacts on fish populations in the river.

#### *5.4.2 Forage Fish*

##### ***No Action Alternative***

Under the No Action Alternative, there would be no change to the site that would affect forage fish species in the Duwamish River. The small area of existing intertidal saltmarsh would remain as an area of native habitat supporting the food web interactions between benthic invertebrate, forage fish, and anadromous salmonids.

##### ***Preferred Alternative: Single Entrance, Mudflat and Marsh, Armored Upstream Entrance, Salvage Disturbed Portions of Marsh***

Under the Preferred Alternative, there would be an increase of 1.66 acres of intertidal mudflat and an increase of 0.76 acres of intertidal saltmarsh created as a result of this restoration project. These habitats would directly increase foraging habitat for forage fish in the lower Duwamish River by increasing habitat for the benthic and epibenthic invertebrates that they feed on. Similarly, removal of the existing rip rapped shoreline and the addition of a planted riparian buffer would contribute to an increase in the functional value of the site for exporting organic material and littoral insects into the food web.

Water quality impacts such as increased turbidity and decreased dissolved oxygen during the periods of 'in-water' work could reduce the suitability of the eastern shoreline of the Duwamish River for forage fish species during construction, but this effect would be temporary and localized. As there are no known areas of forage fish spawning in the lower Duwamish River, the Preferred Alternative would not impact forage fish reproduction.

The excavation would likely kill any sand lances that are buried within the sediment in this area. However, based on fish sampling conducted by USFWS in 2001, few sand lances are expected within the limited area of intertidal work. Less than ten sand lance were captured downstream of the project site at both the Turning Basin and the Hamm Creek estuary restoration sites (Low and Myers 2002). There would also be a temporary decrease in benthic and epibenthic invertebrates within the portion of the existing salt marsh that is excavated during connection of the tidal channel to the Duwamish River. The small area of intertidal impact would be regraded to elevations suitable for use by sand lance once excavation is completed and is also expected to be quickly recolonized by invertebrates from adjacent undisturbed areas.

Such temporary impacts are limited in time and in space to the immediate vicinity of construction activities that need to take place below mean higher high water. As such, they are not expected to have significant or long-term impacts on forage fish populations in the river.

## **5.5 Wildlife**

Information describing the environmental effects on wildlife of the Green/Duwamish River basin is presented in Section 4.9 of the FPEIS (USACE and King County DNR 2000). A synopsis of site-specific information relevant to the proposed restoration project site is presented below.

### *5.5.1 Birds*

#### ***No Action Alternative***

Under the No Action Alternative, the small area of existing intertidal saltmarsh would remain as an area of native habitat supporting the food web interactions between benthic invertebrates, fish, and birds. The progressive development of vegetation on the site would provide limited refuge and foraging habitat for species of birds such as sparrows, nuthatches, and chickadees that are adapted to urban environments and capable of utilizing such habitats.

#### ***Preferred Alternative: Single Entrance, Mudflat and Marsh, Armored Upstream Entrance, Salvage Disturbed Portions of Marsh***

Under the Preferred Alternative, there would be an increase of 1.66 acres of intertidal mudflat and an increase of 0.76 acres of intertidal saltmarsh created as a result of this restoration project. These habitats would directly increase foraging habitat for shore and water birds in the lower Duwamish River by increasing habitat for the intertidal plants, invertebrates, and fish that they feed on. Similarly, removal of the existing rip rapped shoreline and the addition of a planted riparian buffer would contribute to an increase in the functional value of the site through restoration of a greater variety of native tree and shrub species to the riparian zone. The installation of nesting boxes and platforms, large woody debris, and the undulating edges of the project design will also enhance nesting and foraging opportunities for a greater variety of birds.

Shorebirds, waterfowl, great blue herons, and the variety of passerines foraging or resting within and along the Duwamish River at the time of construction may be temporarily displaced due to the noise and movement of the machinery. However, these effects would be temporary and displaced birds would be expected to return to the area after construction is completed. As urban-adapted predators, bald eagles, osprey, peregrine falcons, and other raptors that may be foraging over the area are unlikely to be affected by the construction activities as the forage for fish and birds over the Duwamish River. No breeding or nesting areas will be directly impacted,

as the construction will take place in mid to late summer. Construction of the restoration site is not expected to result in a long-term reduction in the abundance or distribution of any prey items local birds would be seeking.

### *5.5.2 Marine Mammals*

#### ***No Action Alternative***

Under the No Action Alternative, there would be no change to the site that would affect marine mammals within the Duwamish River. The small area of existing intertidal saltmarsh would remain as an area of native habitat supporting the food web interactions that support marine mammals.

#### ***Preferred Alternative: Single Entrance, Mudflat and Marsh, Armored Upstream Entrance, Salvage Disturbed Portions of Marsh***

Under the Preferred Alternative, there would be an increase of 1.66 acres of intertidal mudflat and an increase of 0.76 acres of intertidal saltmarsh created as a result of this restoration project. These habitats would directly increase foraging habitat for fish in the lower Duwamish River by increasing habitat for the benthic and epibenthic invertebrates that they feed on. Thus, this restoration project provides food web support to marine mammals such as the harbor seal that forage on fish within the lower Duwamish River.

Any marine mammals (most likely harbor seals) that are foraging within the Duwamish River at the time of construction may be temporarily displaced due to the noise and movement of the machinery. However, these effects would be temporary and displaced seals would be expected to return to the area after construction is completed. No haul out or pupping areas exist on the lower Duwamish River. Construction of the restoration site is not expected to result in a long-term reduction in the abundance or distribution of any prey items local marine mammals would be seeking.

### *5.5.3 Amphibians, Reptiles, and Terrestrial Mammals*

#### ***No Action Alternative***

Under the No Action Alternative, the small area of existing intertidal saltmarsh would remain as an area of native habitat supporting the food web interactions between benthic invertebrates, fish, and terrestrial mammals such as raccoons. The progressive development of vegetation on the site would provide limited refuge and foraging habitat for species of amphibians, reptiles, and terrestrial mammals that are adapted to urban environments, capable of utilizing such habitats, and able to move between isolate patches of habitats within an urban setting. Such species could include raccoons, opossums, rats, and garter snakes.

#### ***Preferred Alternative: Single Entrance, Mudflat and Marsh, Armored Upstream Entrance, Salvage Disturbed Portions of Marsh***

Under the Preferred Alternative, there would be an increase of 1.66 acres of intertidal mudflat and an increase of 0.76 acres of intertidal saltmarsh created as a result of this restoration project. These habitats would directly increase foraging habitat for urban adapted amphibians, reptiles, and terrestrial mammals in the lower Duwamish River by increasing habitat for the invertebrates and fish that they feed on. Similarly, removal of the existing rip rapped shoreline and the addition of a planted riparian buffer would contribute to an increase in the functional value of the

site through restoration of a greater variety of native tree and shrub species in the riparian zone, providing habitat for terrestrial mammals and possibly for urban adapted reptile species such as garter snakes and amphibian species such as Pacific chorus frogs. The installation of large woody debris and the undulating edges of the project design will also enhance refuge and foraging opportunities for these species.

Amphibians, reptiles, and terrestrial mammals foraging or resting within and along the Duwamish River at the time of construction may be temporarily displaced due to the noise and movement of the machinery. However, these effects would be temporary and displaced animals would be expected to return to the area after construction is completed. As there is very little vegetated habitat currently on the site, little direct impact to local animals is expected during construction. Similarly, no breeding areas will be directly impacted, as the construction will take place in mid to late summer. Construction of the restoration site is not expected to result in a long-term reduction in the abundance or distribution of any prey items local amphibians, reptiles, or terrestrial mammals would be seeking.

## **5.6 Threatened and Endangered Species**

Information describing the environmental effects on threatened and endangered fish species of the Green/Duwamish River basin is presented in Section 4.7.4 of the FPEIS (USACE and King County DNR 2000); the effects on threatened and endangered plant species is presented in Section 4.8.3 of the FPEIS and effects on threatened and endangered wildlife species is presented in Section 4.9.2 of the FPEIS (USACE and King County DNR 2000). A synopsis of site-specific information relevant to the proposed restoration project site is presented below. In addition, a discussion of critical habitat and the reinitiation of consultation with the USFWS and NOAA Fisheries is contained in the description of effects under the preferred alternative.

### ***No Action Alternative***

Under the No Action Alternative, there would be no change to the site that would affect threatened or endangered species or designated critical habitat that may be found within and along the Duwamish River. The small area of existing intertidal saltmarsh would remain as an area of native habitat supporting the food web interactions between benthic invertebrates, Puget Sound Chinook salmon, Coastal/Puget Sound bull trout, and fish-eating birds such as the bald eagle. The progressive development of vegetation on the site could ultimately provide perching opportunities for bald eagles.

### ***Preferred Alternative: Single Entrance, Mudflat and Marsh, Armored Upstream Entrance, Salvage Disturbed Portions of Marsh***

Under the Preferred Alternative, there would be an increase of 1.66 acres of intertidal mudflat and an increase of 0.76 acres of intertidal saltmarsh created as a result of this restoration project. These habitats would directly increase foraging habitat for Puget Sound Chinook salmon, Coastal/Puget Sound bull trout, and bald eagles in the lower Duwamish River by increasing habitat for the invertebrates and fish that they feed on. Similarly, removal of the existing rapped shoreline and the addition of a planted riparian buffer would contribute to an increase in the functional value of the site through restoration native tree and shrub species to the riparian zone, ultimately providing roosting or perching habitat for bald eagles and additional foodweb support into the aquatic food web. The installation of large woody debris and the undulating

edges of the project design will also enhance refuge and foraging opportunities for Puget Sound Chinook salmon and Coastal/Puget Sound bull trout.

The in-water construction of this project would occur when juvenile and adult Puget Sound chinook salmon and bull trout are least likely to be present in the Duwamish River, and during the portion of the year when bald eagles are not nesting and are most tolerant of disturbance. Therefore, while the proposed construction may affect these species, it is not likely to adversely affect them.

The effect determinations made in the Programmatic Biological Assessments for this project are listed in Table 3. The USFWS concurred with the determination of “may affect, but not likely to adversely affect” for the bald eagle, marbled murrelet, northern spotted owl, gray wolf, Canada lynx, and bull trout in relation to the North Wind’s Weir restoration project via a concurrence letter dated March 27, 2001 (Appendix B). Similarly, NOAA Fisheries concurred with the determination of “may affect, but not likely to adversely affect” for Puget Sound chinook salmon in relation to the North Wind’s Weir restoration project via a concurrence letter dated April 10, 2001 (Appendix B). The project, as proposed and considered by the Services, entailed initially retaining the riverbank intact and constructing the recommended alternative features behind a berm separating the project from the Duwamish River, and at the conclusion of construction opening the berm to permit free communication between the project site and the Duwamish River. Copies of the Programmatic Biological Assessments are available from the Corps upon request.

In the interim since the Programmatic BA was prepared, submitted, and concurred with, the southern resident distinct population segment of killer whales has been listed as an endangered species, and critical habitat has been designated for Puget Sound Chinook salmon and Puget Sound/Coastal bull trout. The geographical limit of this new critical habitat is defined as the lateral extent of the width of the stream channel as defined by its bankfull elevation. If the bankfull elevation is not evident on either bank, the OHWL, as defined by the U.S. Army Corps of Engineers, would be used to determine the lateral extent of critical habitat (69 FR 35782). During the construction period, the majority of the project footprint is landward of the geographical extent of designated critical habitat. A functionally significant but geographically minor portion of the recommended alternative involves in-water work: breaching the berm to open communication with the waterway. The opening of this breach is slated to be the last significant component of the project to be completed. This in-water work would fall within the limits of the designated critical habitat.

Pursuant to 50 CFR 402.16, because a portion of the project footprint will fall within the newly designated critical habitat, the Corps plans to reinitiate consultation with the USFWS and NOAA Fisheries, pertaining solely to the portion of the project falling within the bankfull elevation in the designated critical habitat. That consultation is expected to take a minimum of six months. The Corps has determined the project will have no effect on killer whales; thus there will be no further consultation with the Services regarding potential project effects on killer whales.

The Corps has concluded that it is of paramount importance to initiate this project expeditiously. It is expected to provide clear net benefits in enhanced habitat for listed and other species, and restoration of intertidal, estuarine habitat in the lower Duwamish River has been identified in

numerous studies as well as by representatives from NOAA Fisheries, USFWS, and WDFW as a critical component of salmonid recovery efforts in the Green-Duwamish basin. Nearly all intertidal wetlands and shallow subtidal aquatic habitats in the vicinity of Elliott Bay and the lower Duwamish River have been eliminated as a result of urban and industrial development; only about 1 percent of estimated 4,000 acres of tidal and intertidal habitat remains today. Estuaries and their associated intertidal habitats provide essential foraging and resting habitats that juvenile salmonids utilize while undergoing the physiological transformations that enable them to enter into saltwater. This restoration effort will recreate intertidal marsh vegetation along the lower Duwamish and in so doing, contribute to enhanced juvenile salmonid survival during outmigration.

Furthermore, the Corps has committed to the pertinent Congressional representatives, the project Non-Federal Sponsor, and interested Tribes and agencies -- including the Services -- to make every possible effort to initiate the execution of this component of the Green/Duwamish River Basin Ecosystem Restoration Plan this fiscal year, so as to accelerate implementation of one of the five initial projects that will eventually constitute 45 project-specific and programmatic restoration measures throughout the region.

Thus the Corps intends to proceed with the construction and restoration activities in the upland portion of the recommended alternative, while awaiting the conclusion of the consultation process covering activities within the portion of the project footprint that falls below the bankfull elevation.

In doing so, the Corps is making no new, or incremental, "irreversible or irretrievable commitment of resources with respect to the agency action which has the effect of foreclosing the formulation or implementation of any reasonable and prudent alternative which would avoid violating section 7(a)(2)." In proceeding with the described component of the project while awaiting conclusion of the consultation process under Section 7(a), the Corps will comply with Section 7(d) of the ESA and 50 CFR 402.09. The Services have previously evaluated the Corps' proposed action in the upland component of the project site, and concurred with the Corps' conclusion that there is not likely to be an adverse effect on species that were listed at the time of the consultation (e.g. Puget Sound Chinook salmon, Puget Sound/Coastal bull trout). Since that time, the southern resident distinct population segment of killer whales has been listed as an endangered species. However, the Corps has determined that the proposed project will have no effect on killer whales. Otherwise, no new species listings have occurred in the project area since the Services' concurrence, and the sequencing and manner of execution of the upland work has not changed since the Services reviewed the Corps' project plans. The upland work will thus have no impacts on listed species not already considered by the Services, and remains not likely to adversely affect those listed species or designated habitat.

The Corps will refrain from any project work below the bankfull elevation, and thus within designated critical habitat, until the reinitiated consultation process is concluded. In light of the fact that the Corps expects and intends to provide a net environmental benefit through this ecosystem restoration project, enhancing habitat for listed and non-listed species alike, the Corps is prepared to adopt and implement all reasonably conceivable reasonable and prudent measures

and/or alternatives that may be directed by the Services under Section 7(a), prior to undertaking the in-water work.

## **5.7 Cultural Resources**

Information describing the effects on cultural and historic resources of the Green/Duwamish River basin is presented in Section 4.18 of the FPEIS (USACE and King County DNR 2000). A synopsis of site-specific information relevant to the proposed restoration project site is presented below.

### ***No Action Alternative***

Under the No Action Alternative there will be no compliance issues with Section 106 of the NHPA.

### ***Preferred Alternative: Single Entrance, Mudflat and Marsh, Armored Upstream Entrance, Salvage Disturbed Portions of Marsh***

Under the Preferred Alternative, the project has the potential to affect unrecorded historic properties if excavation extends below the fill covering the area. Archaeological monitoring during construction will be conducted due to the possibility that the excavation could reach intact sediments below the fill.

## **5.8 Native American Concerns**

Information describing the effects on cultural and historic resources of the Green/Duwamish River basin is presented in Section 4.18 of the FPEIS (USACE and King County DNR 2000). A synopsis of site-specific information relevant to the proposed restoration project site is presented below.

### ***No Action Alternative***

Under the No Action Alternative there will be no change to the site that would affect the harvest of fish or shellfish by Native American Tribes. There would also be no increase in the area or quality of locally available foraging and rearing habitat for salmon in the lower Duwamish River and thus no benefit to the local harvest of salmon by Native American Tribes.

### ***Preferred Alternative: Single Entrance, Mudflat and Marsh, Armored Upstream Entrance, Salvage Disturbed Portions of Marsh***

Under the Preferred Alternative, the project would increase the amount of intertidal habitat available to salmon in the lower Duwamish River and would improve the quality of rearing and foraging habitat available to this important resource for Native American Tribes in the area. Coordination with the Muckleshoot Indian Tribe has been ongoing throughout this project to ensure fishing and shellfish harvesting concerns were incorporated into the site design. Construction of the project would be timed to avoid impacts to both out-migrating juvenile salmonids and adults moving upstream to spawn. Thus, construction would also avoid impacts to fishing rights of the Muckleshoot Indian Tribe.

## **5.9 Land Use**

Information describing the environmental effects on land and shoreline use in the Green/Duwamish River basin is presented in Section 4.13 of the FPEIS (USACE and King

County DNR 2000). A synopsis of site-specific information relevant to the proposed restoration project site is presented below.

#### ***No Action Alternative***

Under the No Action Alternative, there would be no change to the site that would affect local land use along the Duwamish River. The area would continue to be heavily industrialized and the shoreline would continue to be rip rapped.

#### ***Preferred Alternative: Single Entrance, Mudflat and Marsh, Armored Upstream Entrance, Salvage Disturbed Portions of Marsh***

Under the Preferred Alternative, the increase of 1.66 acres of intertidal mudflat and 0.76 acres of intertidal saltmarsh created as a result of this restoration project would incrementally increase the area of restored habitat within the lower Duwamish River and would thus change the land use of the immediate project site. There would likely be no change in the use of adjacent industrial or commercial facilities as a result of the project, nor would there be any change in the use of the Duwamish River by industrial or commercial vessels. However, there will be changes in the extent of the shoreline jurisdiction that could impact an adjacent land owner (Pacific Strapping, Inc.). This issue is currently under discussion between the adjacent land owner and King County (the local project sponsor). Some minor changes in the project design and implementation may occur in response to other concerns raised by the adjacent property owner, but these changes are not expected to alter the analysis of potential effects as presented in this document.

### **5.10 Recreation**

Information describing the environmental effects on recreation in the Green/Duwamish River basin is presented in Section 4.14 of the FPEIS (USACE and King County DNR 2000). A synopsis of site-specific information relevant to the proposed restoration project site is presented below.

#### ***No Action Alternative***

Under the No Action Alternative, there would be no change to the site that would affect local recreation along the Duwamish River. The area would continue to be heavily industrialized and the shoreline would continue to be rip rapped. The Duwamish River would continue to support heavy industrial, commercial, and recreational vessel use, but no new areas of recreational interest would be created.

#### ***Preferred Alternative: Single Entrance, Mudflat and Marsh, Armored Upstream Entrance, Salvage Disturbed Portions of Marsh***

Under the Preferred Alternative, it is possible that recreational use of the portion of the channel around the rock weir might increase slightly as a result of attracting passive recreational use to the site via the hand-launch boat ramp and the interpretive trail within the riparian buffer of the project site. However, due to the highly industrialized area surrounding the project, it is unlikely that this area would become a recreational destination or that this project would otherwise significantly increase recreational visitors to the immediate area of the project.

As stated below in Section 5.12, construction vehicles may temporarily disrupt local traffic around the restoration site. Noise associated with the usage of heavy machinery may disturb recreational users of the footbridge over the river, the Cecil B. Moses Memorial park across the

river, or recreational kayakers on the river. However, these impacts will be temporary and highly localized, so no significant impacts on recreation are anticipated following construction.

### **5.11 Air Quality and Noise**

Information describing the environmental effects on air quality and noise in the Green/Duwamish River basin is presented in Sections 4.10 and 4.11, respectively, of the FPEIS (USACE and King County DNR 2000). A synopsis of site-specific information relevant to the proposed restoration project site is presented below.

#### ***No Action Alternative***

Under the No Action Alternative, there would be no change to the site that would affect local air quality or noise levels along the Duwamish River. The area would continue to be heavily industrialized with the incumbent air quality and noise issues associated with industrial traffic and processes. The Duwamish River would continue to support heavy industrial, commercial, and recreational vessel use with the associated levels of air pollution and noise generated.

#### ***Preferred Alternative: Single Entrance, Mudflat and Marsh, Armored Upstream Entrance, Salvage Disturbed Portions of Marsh***

As stated above in Section 5.8, under the Preferred Alternative, construction vehicles may temporarily increase air emissions and noise in the immediate project vicinity. Noise associated with the usage of heavy machinery may disturb recreational users of the footbridge over the river, the Cecil B. Moses Memorial Park across the river, or recreational kayakers on the river. However, these impacts will be temporary and highly localized, and are not expected to result in significant impacts.

### **5.12 Transportation**

Information describing the environmental effects on traffic and transportation in the Green/Duwamish River basin is presented in Section 4.12 of the FPEIS (USACE and King County DNR 2000). A synopsis of site-specific information relevant to the proposed restoration project site is presented below.

#### ***No Action Alternative***

Under the No Action Alternative, there would be no change to the site that would affect local transportation routes or volumes along the Duwamish River. Traffic would continue to occur primarily along East Marginal Way, Tukwila International Boulevard, and the South Boeing Access Road to the east of the site and along West Marginal Way and Highway 99 across the river and to the west of the project site.

#### ***Preferred Alternative: Single Entrance, Mudflat and Marsh, Armored Upstream Entrance, Salvage Disturbed Portions of Marsh***

Under the Preferred Alternative, construction vehicles may temporarily increase the volume of traffic in the immediate project vicinity during excavation of the site. Construction vehicles may disrupt traffic along East Marginal Way, Tukwila International Boulevard, and the South Boeing Access Road. Congestion could increase slightly during peak commuting hours due to the movement of construction vehicles back and forth to the restoration site, particularly along South 112<sup>th</sup> Street, which currently receives very little traffic. However, these impacts will be temporary and highly localized, and are therefore not expected to be significant.

### **5.13 Aesthetics**

Information describing the environmental effects on visual quality and aesthetic resources of the Green/Duwamish River basin is presented in Section 4.15 of the FPEIS (USACE and King County DNR 2000). A synopsis of site-specific information relevant to the proposed restoration project site is presented below.

#### ***No Action Alternative***

Under the No Action Alternative, there would be no change to the site that would affect local aesthetics along the Duwamish River. The area would continue to be heavily industrialized with few areas of native habitat providing visual interest. No change would be expected to the rock weir, footbridge over the Duwamish River, or the Cecil B. Moses County Park to the west/southwest of the site. The upstream and downstream portions of the river would continue to be visible from the footbridge to provide limited bird and marine mammal watching opportunities.

#### ***Preferred Alternative: Single Entrance, Mudflat and Marsh, Armored Upstream Entrance, Salvage Disturbed Portions of Marsh***

Under the Preferred Alternative, removing the fill and remnant foundations on the site and replacing them with a variety of native plant species would increase the visual and aesthetic resources of the project site. Wildlife attracted to the site would also likely increase the aesthetic attractiveness of the project site. However, due to the highly industrialized area surrounding the project, it is unlikely that this area would become a recreational destination due to its aesthetic resources. Rather, as noted in Section 5.10 above, increased recreational use of the site could result from more frequent or longer visits by local workers and recreational kayakers as a result of the restoration actions.

As stated above in Section 5.12, during excavation and construction of the site, the aesthetic attractiveness of the general area could be reduced due to the noise and air emissions generated by the construction equipment, which may disturb recreational users of the footbridge, the Cecil B. Moses Memorial Park, or recreational kayakers on the river. However, these impacts will be temporary and highly localized, and are not expected to result in significant impacts.

## **6.0 UNAVOIDABLE ADVERSE EFFECTS**

Unavoidable adverse effects of the proposed project include: (1) noise disturbance to wildlife and recreational users in the vicinity of operating heavy machinery during excavation and construction of the restoration site; (2) disruption of local traffic in the project vicinity during construction; (3) mortality of sessile and mobile benthic and epibenthic fish and invertebrates within the portions of the existing intertidal marsh and mudflat during excavation down to design elevations; (4) mortality of the limited understory vegetation and some trees within the project site, and (5) excavation of approximately 0.06 acres of existing intertidal marsh. Given the temporary, localized, and minor nature of these effects, the Corps has determined that the proposed restoration project is not expected to result in significant adverse environmental impacts.

## **7.0 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES**

The proposed restoration project would not entail any significant irretrievable or irreversible commitments of resources. The construction work would require use of existing machinery and export of the fill material to an existing, licensed landfill for disposal. Replanting of the site following excavation would require contracting with local existing nurseries for native plant materials and hiring existing contractors to plant the site.

## **8.0 CUMULATIVE IMPACTS**

Cumulative impacts result from the “individually minor but collectively significant actions taking place over a period of time” (40 CFR 1508.7). As such they include the impacts of this restoration project considered in conjunction with current and future restoration projects constructed or planned within the lower Green/Duwamish River watershed.

By the end of calendar year 2003, there will be nine major intertidal projects (mostly restoration projects, some with mitigation components) implemented within the lower nine miles of the Duwamish River. These sites have been constructed under the Coastal America program, as remediation under the Natural Resources Defense Act (NRDA), or by the Corps under Section 1135 of the Water Resources Development Act. The sites encompass a total of approximately 29.5 acres of restored habitat (acreage sources include People for Puget Sound, Taylor and Associates, Inc. and Corps records). Negative effects of the North Wind’s Weir Intertidal Restoration project add to the cumulative negative effects of the previous series of nine constructed restoration projects. However, these negative effects are temporary and are associated only with the actual construction of the project, concentrated mainly as the restored site is hydraulically rejoined to the Duwamish River. The combination of mitigation measures, BMPs, and post-construction monitoring of the restored sites reduce the cumulative, short-term (i.e. construction related) impacts of these projects to an insignificant level.

More significantly, these short term negative effects are compensated for by the long-term, spatially cumulative benefits to the amount and functional value of restored habitat, improvements in the overall watershed condition through decreased fragmentation of habitats, and the ultimately increased ability of the watershed to support critical life history stages of native fish and wildlife populations. Thus, the proposed restoration project will have beneficial cumulative effects within the watershed and would also incrementally offset adverse impacts on habitats from past, present, and future redevelopment projects along the lower river.

The North Wind’s Weir restoration project will encompass approximately 3.27 acres of restored habitat in the lower nine miles of the Duwamish River, an increase of approximately 11% in the total area of restored habitat in the lower river. Ultimately, the cumulative positive effects of the progressive increase in restored areas along the Duwamish River remains to be documented. The Corps and King County DNRP hope that the system may ultimately reach a point of exporting sufficient viable seeds to recolonize appropriate elevations within the lower river. The point at which this may occur along the trajectory of progressively increasing areas of intertidal habitat, remains unknown. One day these restored habitats could thus become the catalyst for natural restoration of the albeit limited areas of shoreline left along the Duwamish River.

## 9.0 ENVIRONMENTAL COMPLIANCE

<b>LAWS AND REGULATIONS RELATING TO THE PROPOSED ALTERNATIVES</b>	<b>ISSUES ADDRESSED</b>	<b>CONSISTENCY OF PREFERRED ALTERNATIVE</b>
National Environmental Policy Act (NEPA) 42 U.S.C. 4321 et seq.	Requires all federal agencies to consider the environmental effects of their actions and to seek to minimize negative impacts	Consistent per FONSI and EA document
Clean Air Act	Requires federal agencies to consult with state air pollution control agencies to assure that construction plans conform to local air quality standards.	Consistent; project is not within a non-attainment area.
Clean Water Act (CWA) 33 U.S.C. 1251 et seq.; Section 404	Requires federal agencies to protect waters of the United States. Disallows the placement of dredged or fill material into waters (and excavation) unless it can be demonstrated there are no reasonable alternatives.	Consistent with the requirements of Nationwide Permit (NWP) 27 for stream and wetland restoration activities, so an evaluation under the 404(b)(1) Guidelines is not required.
Clean Water Act Section 401	Requires federal agencies to comply with state water quality standards.	Will be consistent with 401 permit requirements as issued by Washington Department of Ecology
Rivers and Harbors Act	Prohibits the construction of any bridge, dam, dike, or causeway over or in navigable waters of the U.S. in the absence of Congressional consent and approval of the plans by the Chief of Engineers and the Secretary of the Army.	Not in Section 10 jurisdiction
Fish and Wildlife Coordination Act 16 U.S.C. 661 et seq.	Requires federal agencies to consult with the US Fish & Wildlife Service on any activity that could affect fish or wildlife.	Consistent based on acceptance of Final FWCA Report prepared for the FEIS
Endangered Species Act 16 U.S.C. 1531 et seq.;	Requires federal agencies to protect listed species and consult with US Fish & Wildlife or NMFS regarding the proposed action.	Consistent based on the Biological Assessment prepared for the FEIS
National Historic Preservation Act 16 U.S.C. 461;	Requires federal agencies to identify and protect cultural and historic resources.	Consistent based on concurrence by SHPO on 12 May, 2004.
Coastal Zone Management Act (CZMA) 16 U.S.C. 1451 et seq.; 15 CFR 923	Requires federal agencies to comply with state and local plans to protect and enhance coastal zone and shorelines.	Consistent to the maximum extent practicable
Washington Hydraulic Code	Requires proponents of developments, etc to protect state waters, wetlands and fish life.	Not applicable to Federal projects; King County obtained an HPA on 8 September, 2004.

<b>LAWS AND REGULATIONS RELATING TO THE PROPOSED ALTERNATIVES</b>	<b>ISSUES ADDRESSED</b>	<b>CONSISTENCY OF PREFERRED ALTERNATIVE</b>
Executive Order 11988: Floodplain Management Guidelines	Requires federal agencies to evaluate the potential effects of actions on floodplains and to avoid undertaking actions that directly or indirectly induce growth in the floodplain or adversely effect natural floodplain values	Consistent, project will not induce growth in floodplain and will restore natural floodplain values
Executive Order 11990: Protection of Wetlands	Encourages federal agencies to take actions to minimize the destruction, loss, or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands when undertaking Federal activities and programs	Consistent, wetland area will be increase as a result of this project; majority of existing marsh will be protected; a portion of marsh will be salvaged and replanted during construction
Executive Order 12898: Environmental Justice	Requires federal agencies to consider and address environmental justice by identifying and assessing whether agency actions may have disproportionately high and adverse human health or environmental effects on minority or low-income populations	Consistent due to lack of adverse human health or environmental effects on minority or low-income populations in local area

Copies of the Draft Environmental Assessment and FONSI were provided to the following organizations for Review and comment:

Muckleshoot Indian Tribe  
U.S. Fish and Wildlife Service  
National Marine Fisheries Service  
Environmental Protection Agency  
Washington State Department of Ecology  
Washington State Department of Fish and Wildlife  
Washington State Historic Preservation Office  
King County

In addition a Notice of Availability was sent out to adjacent property owners as well as selected interested parties identified by the Washington State Department of Ecology, King County, and the Seattle District Regulatory Branch. The draft documents were also posted on the Seattle District website. The Green Duwamish ERP Technical Committee that includes representatives from all the agencies listed above except the Washington State Historic Preservation Office also reviewed project details.

The Draft Environmental Assessment and FONSI were circulated for 30 days. Two written comment letters were received in response to the EA and FONSI – one from an adjacent property owner and another from the WRIA 9 project coordinator (Appendix E). King County has been

in extensive discussions with the property owner to address the concerns raised, and the comments are being addressed in the final design drawings.

## **10.0 CONCLUSION**

Based on this Environmental Assessment and on coordination with Federal agencies, Native American Tribes, and State agencies, the North Wind's Weir Intertidal Restoration project is not expected to result in significant adverse environmental impacts. However, ESA consultation has been reinitiated under 50 CFR 402.16 on project activities falling below the bankfull elevation. Although construction and implementation work will be initiated on the upland portion of the recommended alternative -- i.e., that portion of the project footprint that falls landward of the bankfull elevation, the Corps will refrain from any project work below the bankfull elevation, and thus within designated critical habitat, until the reinitiated consultation process is concluded. In light of the fact that the Corps expects and intends to provide a net environmental benefit through this ecosystem restoration project, enhancing habitat for listed and non-listed species alike, the Corps is prepared to adopt and implement all reasonably conceivable reasonable and prudent measures and/or alternatives that may be directed by the Services under Section 7(a), prior to undertaking the in-water work. The construction and implementation activities in the upland portion of the project site are not expected to foreclose or limit the choice of reasonable alternatives that may become necessary as a result of the reinitiated consultation. In the event that the reinitiated consultation process results in substantial changes in the project that are relevant to environmental concerns not already considered by the Corps in this EA, the Corps will withdraw the FONSI at that time, re-evaluate the impacts of the project on the quality of the human environment, modify the EA as necessary, and as necessary promulgate a replacement FONSI or initiate an Environmental Impact Statement.

## **11.0 PUBLIC REVIEW AND COMMENTS**

Two comments were received on the draft Environmental Assessment, which was available for public comment from January 5 to February 6, 2004.

### **11.1 Comment**

Comments were received from an adjacent property owner, Mr. Sven Bitners, and from the WRIA 9 project coordinator, Ms. Linda Hanson. Copies of both comment letters are available in Appendix E. Mr. Bitners raised several construction design issues that he has concerns about in regards to safety and flooding potential on his property. In addition, he is also concerned about the change in shoreline designation that will result from the restoration of estuarine wetlands adjacent to his property, and how that change in designation will impact his property values and the potential future development of the property.

Ms. Hanson's comments were mostly editorial in nature with the exception of a suggestion to alter the proposed planting palette to incorporate more native evergreen species to limit erosion, diversify winter habitat, and enhance the visual quality of the completed restoration.

## 11.2 Response

King County has been in extensive discussion with Mr. Bitners to address the concerns that he raised in his comment letter. Specific steps taken to address his concerns prior to construction include a hydraulic analysis of the risk of increased flooding to Mr. Bitners' property as a result of the project implementation, a geotechnical evaluation of the stability of the wall along the east property line of the North Wind's Weir site in relation to potential water seepage, and an evaluation of the feasibility of relocating the existing outfall from his property at a point yet to be determined on the North Wind's Weir site. Mr. Bitners' property currently experiences nuisance flooding that requires removal by pumping. In addition, King County has participated in numerous discussions with Mr. Bitners and the City of Tukwila regarding the change in shoreline designation and what the impacts associated with that change may be and how they might be mitigated.

A hydraulic engineer at the Corps' office ran the unsteady HEC-RAS hydraulic model with all combinations of 1-100 year river and tidal floods to determine which combination of events has a maximum stage at a combined probability of 1%. The 1% chance event was selected because it is the standard flood used by FEMA to map and regulate floodplains. The results of the model indicate that the implementation of the North Wind's Weir project will not cause major flooding to Mr. Bitners' property beyond what would occur without the project because it is relatively high compared to the river and river stages are not increased by the project. The elevation and frequency of nuisance ponding currently experienced by Mr. Bitners may increase as a result of the project, requiring additional pumping. However, it is possible that the implementation of the project will actually reduce the frequency and amount of nuisance ponding because the outfall pipe that runs from Mr. Bitners property to the river will be relocated on the North Wind's Weir site and replaced. While the current condition of the pipe is unknown, Corps' and County engineers suspect that it is in poor condition and not properly functioning, contributing to the nuisance ponding that already occurs on Mr. Bitners property. Installation of the new pipe with a properly functioning tidal gate should enhance drainage from the low area on his property.

The geotechnical evaluation of the stability of the wall along the east property line of the North Wind's Weir site has not yet been finalized, but preliminary analysis indicates that there is little cause for concern. The tidal differential may result in the need for pumping during high water events, but this is similar to the existing condition. If the final geotechnical evaluation concludes that the project will adversely impact the stability of the wall, or if a new site condition comes to light during the construction, the Corps and County will work with Mr. Bitners to develop a satisfactory and safe resolution to the problem.

Finally, although Mr. Bitners is correct in his determination that the shoreline designation on his property will change once the project has been implemented, the environmental benefits of the project far outweigh the impact that this change in designation will have upon Mr. Bitners property and associated development opportunities. As a courtesy to Mr. Bitners, King County has participated in extensive discussions with Mr. Bitners and the City of Tukwila to assist in determining what the shoreline jurisdictional restrictions will entail and how Mr. Bitners may best work within the restrictions if he determines that he would like to further develop his property.

Ms. Hanson's suggestions for changes were incorporated into the document. Changes to the proposed planting palette will be addressed at construction.

## 12.0 LITERATURE CITED

- 69 FR 35782, Endangered and Threatened Wildlife and Plants; Proposed Designation of Critical Habitat for the Jarbidge River, Coastal-Puget Sound, and Saint Mary-Belly River Populations of Bull Trout, June 2004.
- 69 FR 74584, Endangered and Threatened Species; Designation of Critical Habitat for 13 Evolutionarily Significant Units of Pacific Salmon (*Oncorhynchus spp.*) and Steelhead (*O. mykiss*) in Washington, Oregon, and Idaho, Dec, 2004.
- 70 FR 52630, Endangered and Threatened Species; Designation of Critical Habitat for 12 Evolutionarily Significant Units of West Coast Salmon and Steelhead in Washington, Oregon, and Idaho, Sept, 2005.
- 70 FR 56212, Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for the Bull Trout, Sept, 2005.
- 70 FR 69903, Endangered and Threatened Wildlife and Plants: Endangered Status for Southern Resident Killer Whales, Nov, 2005.
- Bloomberg, G., C. Simenstad, and P. Hickey. 1988. Changes in the Duwamish River estuary habitat over the past 125 years. Pages 437-454 In: Proceedings of the First Annual Meeting on Puget Sound Research. Volume II. Puget Sound Water Quality Authority, Seattle, Washington.
- Calambokidas, J. 1991. Marine Mammal Specialist, Cascadia Research Collective, Olympia, WA. Personal communication with R. Sturim, Roy F. Weston, Inc. 29, January.
- Cordell, J.R., L.M. Tear, K. Jensen, and H. Higgins. 1999. Duwamish River Coastal America restoration and reference sites: Results from 1997 monitoring studies, University of Washington, School of Fisheries, Fisheries Resource Institute, FRI-UW-9903, Seattle, Washington.
- Cordell, J.R., L.M. Tear, K. Jensen, and V. Luiting. 1997. Duwamish River Coastal America Restoration and Reference Sites: Results from 1996 monitoring studies. University of Washington, School of Fisheries, Fisheries Resource Institute, FRI-UW-9709, Seattle, Washington.
- Environmental Associates, Inc. 2001a. Phase I Environmental Assessment, Site One-Duwamish Tax Lots #042304-9114-09 and 042304-9118-09, Project #083628, Tukwila, Washington, prepared for King County Department of Natural Resources, April 12, 2001.
- Environmental Associates, Inc. 2001b. Preliminary Subsurface Sampling and Testing, Site One-Duwamish, Tax Lots #042304-9114-09 and 042304-9118-09, Project #083628, Tukwila Washington, prepared for King County Department of Natural Resources, June 2001.
- Grette, G.B. and E.O. Salo. 1986. The status of anadromous fishes of the Green/Duwamish

River system. Prepared for the U.S. Army Corps of Engineers, Seattle District. Seattle, Washington.

King County Department of Natural Resources (KCDNR). 2001. State of the Nearshore Ecosystem: Eastern shore of central Puget Sound, including Vashon and Maury Islands (WRIAs 8 and 0). Prepared by Battelle Marine Sciences Laboratory, Sequim, Washington, Pentec Environmental Seattle, Washington, Striplin Environmental Associates, Inc., Seattle Washington, Shapiro Associates, Inc., Seattle, Washington. Prepared for King County Department of Natural Resources, Seattle, Washington.

Kroeger, K; T. Fugl, H. Cumberland, P. Quinn, J. Wiegel. 2001. Poster: Identification of Sources of Toxicity in a Petroleum Hydrocarbon Contaminated Sediment, Hart Crowser, Inc., Port of Portland, and Columbia Analytical Services, Inc., 2001 Society

Low, D. and K.Q. Myers. 2002. Elliott Bay/Duwamish Restoration Program: Year 1 Intertidal Habitat Projects Monitoring Report. Report prepared for the Elliott Bay/Duwamish Restoration Program Panel, by the U.S. Fish and Wildlife Service, Western Washington Fish and Wildlife Office, Lacey, Washington.

Meyer, J.H., T.A. Pearce, and S.B. Patton. 1981. Distribution and food habits of juvenile salmonids in the Duwamish estuary, Washington, 1980. Prepared for the U.S. Army Corps of Engineers, Seattle District, Seattle, Washington, by the U.S. Fish and Wildlife Service, Olympia, Washington.

Perkins, S.J. 1993. Green River channel migration study. King County Department of Public Works, Surface Water Management Division, Seattle, Washington.

Pfeifer, R. 1991. Seattle District Fish Biologist, Washington State Department of Wildlife, Mill Creek, Washington. Personal communication with R.Sturim, of Roy F. Weston, Inc. July 10, 1991.

U.S. Army Corps of Engineers (USACE). 2003a. Field Sampling Plan, Duwamish North Wind's Weir, June 2003.

U.S. Army Corps of Engineers (USACE). 2003b. Analytical Services Agreement, Duwamish North Wind's Weir, July 2003.

U.S. Army Corps of Engineers. 2000. Howard Hanson Dam programmatic biological assessment for continued operation and maintenance and Phase 1 of the additional water storage project. Seattle. Washington.

U.S. Army Corps of Engineers. 1998. Final Feasibility Study Report and final Environmental Impact Statement. Prepared by the U.S. Army Corps of Engineers, Seattle District, Seattle, Washington. August 1998.

- U.S. Army Corps of Engineers. 1997a. Green/Duwamish River Basin general investigation ecosystem restoration study, reconnaissance phase. Prepared by the U.S. Army Corps of Engineers, Seattle District, Seattle, Washington. January 1997.
- U.S. Army Corps of Engineers. 1997b. Green/Duwamish River general investigation ecosystem restoration study, Reconnaissance Report. Prepared by the U.S. Army Corps of Engineers, Seattle District, Seattle, Washington. March 1997.
- U.S. Army Corps of Engineers. 1995. Seaboard Lumber Site aquatic habitat restoration analysis. Submitted to City of Seattle Department of Parks and Recreation, Seattle, Washington.
- U.S. Army Corps of Engineers and King County Department of Natural Resources. 2000. Final Programmatic Environmental Impact Statement and Restoration Plan (FPEIS) for the Green/Duwamish River Basin Ecosystem Restoration Program, prepared by the Seattle District Corps and King County DNR, November 2000.
- U.S. Fish and Wildlife Service (USFWS). 2005. Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for the Bull Trout. Federal Register Vol. 70, No. 185 50 CFR Part 17.
- Warner, E. and R. Fritz. 1995. The distribution and growth of Green River chinook salmon and chum salmon outmigrants in the Duwamish River estuary as a function of water quality and substrate. Muckleshoot Indian Tribe Fisheries Department, Auburn, WA.
- Washington Conservation Commission and the King County Department of Natural Resources. 2000. Habitat Limiting Factors and Reconnaissance Assessment Report, Green/Duwamish and Central Puget Sound Watersheds (WRIA 9 and Vashon Island).
- Water Resource Inventory Area (WRIA) 9. 2002. Near-Term Action Agenda for Salmon Habitat Conservation, Green/Duwamish River and Central Puget Sound Watershed. May, 2002.
- Williams, G.D., A.B. Borde, and R.M. Thom. 2001. Codiga Farm wetland restoration plan vegetation guidance and design review. Batelle Marine Sciences Laboratory. Report to U.S. Army Corps of Engineers, Seattle District. Batelle Contract # 42222. June 29, 2001.
- Weitkamp, D.E., and T.H. Schadt. 1982. 1980 Juvenile Salmonid Study. Unpublished report by Parametrix, Inc. to Port of Seattle, Seattle, WA. 43p. plus appendices.

## **TABLES, PHOTOS, AND FIGURES**

Table 1: Project goals, objectives and constraints

<b>PROJECT GOALS</b>	<b>OBJECTIVES</b>	<b>TARGETED FUNCTIONS</b>	<b>ECOLOGICAL DESIGN CRITERIA</b>	<b>OPPORTUNITIES</b>	<b>CONSTRAINTS</b>	<b>INFORMATION GAINED FROM OTHER SITES*</b>
<b>1) Restore process-based ecological functions of estuarine intertidal and riparian habitats</b>	<b>1) Restoration of intertidal mudflat and marsh habitats</b>	<b>Primary productivity and detrital export from intertidal marsh</b>	Establish correct intertidal elevations to allow native marsh species competitive advantage (at least below +10' based on Turning Basin)	Utilize existing natural marsh as reference site to determine appropriate elevations and species diversity	Need goose excluders over the created marsh and maintenance plan for invasive species	Lack of grading to sufficiently low elevations limited establishment of marshes; Delayed planting could allow development of natural contours
		<b>Secondary productivity (benthic &amp; epibenthic inverts and insects) produced in mudflats and marsh</b>	Establish extremely gradual slopes for mudflat and marsh and diverse microtopography to maximize types of microhabitats	Design to maximize available intertidal area with max. 3:1 slope at outer edge transition to forested buffer; need to overexcavate and back-fill with fine grained, organic rich sediments	Mudflat and marsh can't occupy same space; Desire to retain existing large trees; Proximity of forested buffer to powerlines	Abrupt changes in elevation limited establishment of vegetation and caused erosion
		<b>Habitat complexity and refuge areas</b>	Incorporate large woody debris to create scour pools and increase microtopography	Need to stockpile trees downed during excavation for use on site and retain root-wads during excavation	Investigate potential for scour from woody debris to undermine banks or vegetation	Beneficial use of snags for wildlife habitat at Herring's House; osprey platform used first season at Hamm Creek
	<b>2) Preservation of natural marsh to the greatest extent possible</b>	Very scarce area of natural habitat and source for colonization of created marsh	Physically retain marsh and do not alter hydraulics that maintain marsh	Use model to evaluate anticipated hydraulics to determine impact to natural marsh and erosion potential	Need entrance constructed through part of natural marsh to restore tidal prism to site	Changes in hydraulics post restoration have eliminated some natural marshes

<b>PROJECT GOALS</b>	<b>OBJECTIVES</b>	<b>TARGETED FUNCTIONS</b>	<b>ECOLOGICAL DESIGN CRITERIA</b>	<b>OPPORTUNITIES</b>	<b>CONSTRAINTS</b>	<b>INFORMATION GAINED FROM OTHER SITES*</b>
	<b>2) continued Preservation of natural marsh to the greatest extent possible</b>	Natural marsh functions as reference area for monitoring of restoration effectiveness at other restoration sites on the River by multiple groups of researchers	Minimize area of marsh impacted through design process. Research salvage and replanting techniques to relocate impacted area and minimize total impacts	Retention of natural marsh affords project an ideal reference site to determine effectiveness of design and achievement of objectives; establish baseline conditions in natural marsh prior to construction	Likely need entrance constructed through part of natural marsh to create hydraulics to retain channel and mudflat habitats	Natural marsh at Hamm Creek has been lost due to unanticipated impacts of restoration project; valuable habitat and reference site data lost
<b>1) continued Restore process-based ecological functions of estuarine intertidal and riparian habitats</b>	<b>3) Create habitat conditions attractive to juvenile salmonid rearing</b>	Physical space for osmoregulation & transition; create habitat for fish to forage on benthic invertebrates from mudflat and epibenthic inverts and insects from marsh and riparian	Excavate site low enough to allow unrestricted ingress and egress to marsh and mudflats over max. tidal range	Large site could accommodate the grading and slopes necessary to create mudflat habitat, variety of elevations and habitat types would be attractive to juvenile chinook, coho, and chum	Preservation of natural marsh may preclude a second opening; could construct permeable weir if opening isn't feasible or grade to elevations allowing inflow over marsh at higher tides	Area between Turning Basin and Cecil B. Moses Park important space for juvenile osmoregulation, transition, and rearing – especially for chinook
		Anticipate hydraulic influences on inlet/egress to ensure sufficient tidal prism and address erosion	Excavation to sufficiently low elevation to create juvenile habitat over broadest range of tidal conditions	Large site can accommodate gradual slopes for mudflat and an area of marsh for maximum diversity in habitats. Diversity of elevations max. potential for meeting objective #1	Maximizing the area of mudflat replaces the natural marsh without replacement of lost habitat functions; 404 permitting implications result	Allow for changes in location/extent of inlet/egress to reduce retrofitting as channel may migrate in future.
	<b>4) Increase density and diversity of plant species in buffer</b>	Riparian export of organic matter to intertidal areas; wildlife habitat	Deciduous=leaves berries, fruits, flowers; conifers = cover & nesting	Retain existing large trees where possible	Invasive species maintenance following planting	Invasive species control needed for at least 5 years beyond construction

<b>PROJECT GOALS</b>	<b>OBJECTIVES</b>	<b>TARGETED FUNCTIONS</b>	<b>ECOLOGICAL DESIGN CRITERIA</b>	<b>OPPORTUNITIES</b>	<b>CONSTRAINTS</b>	<b>INFORMATION GAINED FROM OTHER SITES*</b>
<b>1) continued Restore process-based ecological functions of estuarine intertidal and riparian habitats</b>	<b>5) Increase density and diversity of plant species in buffer</b>	Use buffer vegetation to discourage human access to site and/or to provide interpretive overlooks	Target species with thorns or dense branching (roses, hawthorn, vine maple) to discourage access into site by visitors, boaters, dogs	Use existing openings in the trees along outside edge as interpretive overlooks; create interpretive signage to educate about restoration	Human access and recreational use limits wildlife benefits; lack of interpretive facilities limits human benefits	Limited interpretive facilities at other sites; unrestricted human access has compromised ecological potential of some sites
<b>PROJECT GOALS</b>	<b>OBJECTIVES</b>		<b>HUMAN DESIGN CRITERIA</b>	<b>COORDINATION NEEDS</b>	<b>CHALLENGES TO DESIGN TEAM</b>	<b>INFORMATION GAINED FROM OTHER SITES*</b>
<b>2) Respect Tribal uses of site (both current and historic)</b>	<b>1) Preserve cultural integrity of site through early and consistent coordination with Tribes</b>		'North Wind's' weir rocks are of historical significance and are eligible for registration on National Register of Historical Places	Need to establish areas for Tribal use/ preservation early in design phase	Depends upon consistent and accurate communication between Tribes and COE, King County	
<b>3) Support access to hand-launch boat site</b>	<b>2) Direct existing recreational use of site to avoid impacting ecological functions</b>		Kayakers currently launch into rapids from unstable bank at end of 112 <sup>th</sup> Street	Coordinate with kayaking community to ensure support and integrate needs into design	May need access through City Light property; Need to limit human disturbance to restored habitats	Unlimited and undirected human access has compromised ecological functions at other sites

\*Cecil B. Moses Park, Hamm Creek, Turning Basin, and Herring's House are other restoration sites located on the lower Duwamish River

Table 2. Protected Species Addressed in Programmatic Biological Assessments

Species	Listing Status	Critical Habitat
Bald Eagle <i>Haliaeetus leucocephalus</i>	Threatened	—
Marbled Murrelet <i>Brachyramphus marmoratus</i>	Threatened	Designated
Northern Spotted Owl <i>Strix occidentalis caurina</i>	Threatened	Designated
Gray Wolf <i>Canis lupus</i>	Threatened	
Canada Lynx <i>Lynx canadensis</i>	Threatened	—
Coastal/Puget Sound Bull Trout <i>Salvelinus confluentus</i>	Threatened	—
Puget Sound Chinook Salmon <i>Oncorhynchus tshawytscha</i>	Threatened	Designated

Table 3. Threatened and Endangered Species Effect Determination Summary

Species	Listing Status	Critical Habitat	Effects Determination	Services Concurrence for North Wind's Weir?
Bald Eagle <i>Haliaeetus leucocephalus</i>	Threatened	—	Not likely to adversely affect	Yes
Marbled Murrelet <i>Brachyramphus marmoratus</i>	Threatened	Designated	Not likely to adversely affect species or critical habitat	Yes
Northern Spotted Owl <i>Strix occidentalis caurina</i>	Threatened	Designated	Not likely to adversely affect species or critical habitat	Yes
Gray Wolf <i>Canis lupus</i>	Threatened		Not likely to adversely affect	Yes
Canada Lynx <i>Lynx canadensis</i>	Threatened	—	Not likely to adversely affect	Yes
Coastal/Puget Sound Bull Trout <i>Salvelinus confluentus</i>	Threatened	—	Not likely to adversely affect	Yes
Puget Sound Chinook Salmon <i>Oncorhynchus tshawytscha</i>	Threatened	Designated	Not likely to adversely affect species or critical habitat	Yes



Photo 1: Aerial view of site, illustrating developed nature of surrounding land and existing vegetation on the site. Photo is facing upriver to the southeast at high tide.



Photo 2: Southern, downstream portion of rock weir at outgoing tide showing rapids along western (right bank) of Duwamish River. The entrance to the Cecil B. Moses Park restoration site is pictured in the background along the western (right bank). Photo is facing west from the project site.

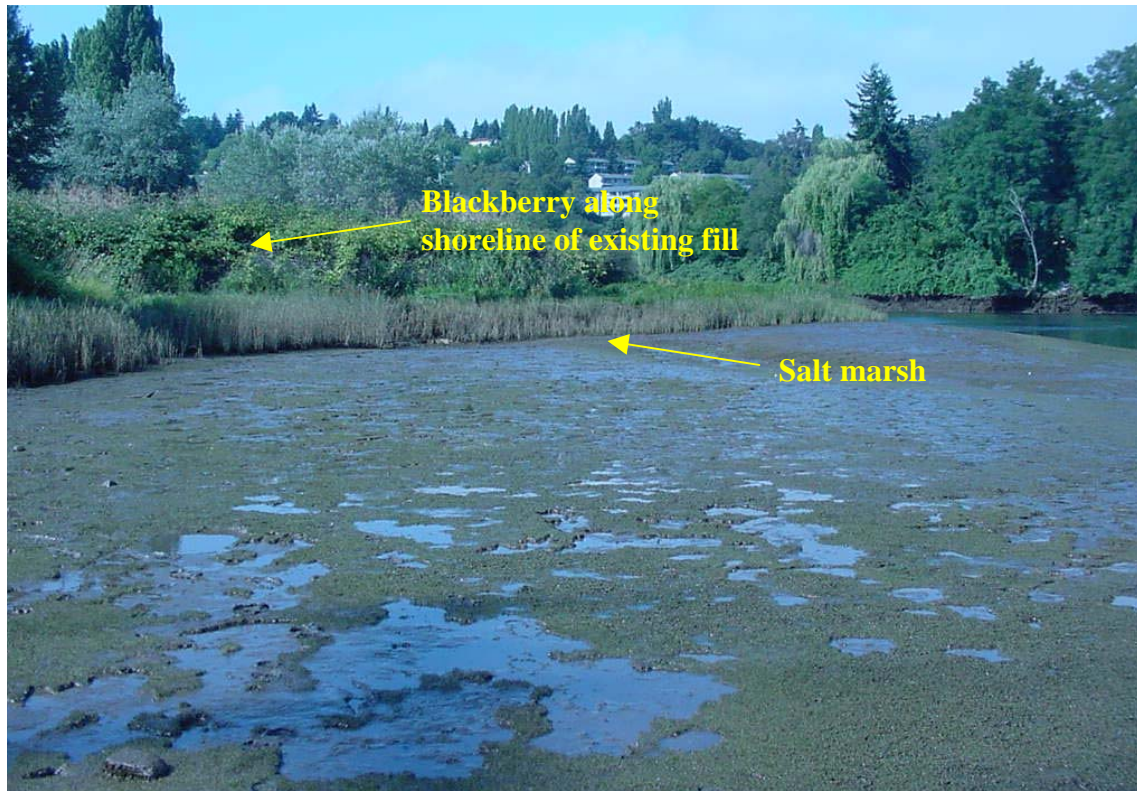


Photo 3: Existing mudflat and salt marsh located off the western side of the project site. Photo is facing upstream to south at low tide. Note the elevation difference between the project site and the mudflat and marsh. Excavation would remove the existing fill and restore the site to intertidal elevations and habitats.



Photo 4: Southern portion of existing saltmarsh along the shoreline of project site, facing downstream to north at low tide. This portion of the marsh is located at the proposed entrance to the restoration site. The marsh in this area will be salvaged and replanted during construction of the restoration site.



## **APPENDICES**

## **APPENDIX A**



STATE OF WASHINGTON  
DEPARTMENT OF ECOLOGY

Northwest Regional Office • 3190 160th Avenue SE • Bellevue, Washington 98008-5452 • (425) 649-7000

**REGISTERED MAIL**

RR 359 893 111 US

October 1, 2004

Noel Gilbrough  
U.S. Army Corps of Engineers  
Environmental Resources Section  
PO Box 3755  
Seattle, WA 98124-2255

Dear Mr. Gilbrough:

**Re: Order # 1629**

U.S. Army Corps of Engineers # **CENWS-PL-04-02**

Water Quality Certification and Coastal Zone Management Consistency Determination to authorize construction of North Wind's Weir Restoration Site, Tukwila, King County, Washington.

The request for certification for proposed work in and adjacent to the Duwamish River has been reviewed. On behalf of the State of Washington, we certify that the proposed work, as conditioned by the enclosed Order, will comply with applicable provisions of Sections 301, 302, 303, 306 and 307 of the Clean Water Act, as amended, and other appropriate requirements of State law.

Pursuant to 16 U.S.C. 1456 et. seq. (Section 307(c)(3) of the Coastal Zone Management Act of 1972 as amended), Ecology concurs with the applicant's determination that this work will be consistent with the approved Washington State Coastal Zone Management Program. This concurrence is based upon the applicant's compliance with all applicable enforceable policies of the Coastal Zone Management Program, including Section 401 of the Federal Water Pollution Control Act.

This certification is subject to the conditions contained in the enclosed Order. If you have any questions, please contact Alice Kelly at (425) 649-7145. Written comments can be sent to her at the Department of Ecology, 3190 – 160<sup>th</sup> Ave. SE, Bellevue, WA 98008. The enclosed Order may be appealed by following the procedures described in the Order.

Sincerely,

A handwritten signature in cursive script, appearing to read "Jeannie Summerhays".

Jeannie Summerhays  
Section Manager  
Shorelands and Environmental Assistance Program

JS:ak  
Enclosure

cc: Victoria Luiting, Corps  
Larry Fisher, WDFW

Yvonne Oliva, Ecology  
Jon Hansen, King County



<b>IN THE MATTER OF GRANTING A</b>	)	<b>ORDER # 1629</b>
<b>WATER QUALITY</b>	)	<b>Corps Reference No. PL-04-02</b>
<b>CERTIFICATION TO</b>	)	North Wind's Weir Intertidal Restoration; 3.3
<b>U.S. Army Corps of Engineers</b>	)	acres of fill removal and grading to restore
in accordance with 33 U.S.C. 1341	)	intertidal and riparian habitat along east side
FWPCA § 401, RCW 90.48.120, RCW	)	Duwamish River; located in Section 4, T. 23 N.,
90.48.260 and Chapter 173-201A WAC	)	R. 4 E., Tukwila, King County, Washington.

TO: Noel Gilbrough  
U.S. Army Corps of Engineers  
Planning Branch  
PO Box 3755  
Seattle, WA 98124-3755

On January 5, 2004, a public notice for a proposed water quality certification from the State of Washington was distributed for the above-referenced project pursuant to the provisions of 33 U.S.C. 1341 (FWPCA §401). The proposed project entails restoration of a 3.27 acre site along the right bank of the Duwamish River to create approximately 1.66 acres of tidal channel and associated intertidal mudflat (below elevation +4 NGVD 88) and approximately 0.76 acres of intertidal and high marsh between elevations +4 and +10 feet NGVD 88 (+6.35 and +12.35 MLLW). A scrub-shrub wetland community between elevations +10 and +12 NGVD 88 (+12.35 and +14.35 MLLW) of approximately 0.17 acres would gradually transition to forested riparian buffer encompassing approximately 0.29 acres to the top of the area of excavation. 300 cubic yards of rock will be placed at the upstream side of the entrance channel to armor and stabilize the bank. The top and backside of the armoring will be capped with soil and planted with vegetation to increase habitat function and improve aesthetics.

The existing riprap and abandoned rubble currently along the shoreline will be excavated and removed. Approximately 0.06 acres of the western side of the existing intertidal marsh will be disturbed to match graded contours, but will be salvaged and replanted within the restoration site.

The proposal includes excavation of 65,000 cubic yards of soil and fill to create the intertidal mudflat and marsh along the right bank of the lower Duwamish River at approximately RM 6.2 in the City of Tukwila. Approximately 234 lineal feet of armored shoreline and 2.6 acres of industrial fill and associated chemical constituents will be removed and properly disposed at approved facilities. Petroleum-contaminated soil on the site will be cleaned up in accordance with Chapter 173-340 WAC.

For purposes of this Order, the term "Applicant" shall mean the U.S. Army Corps of Engineers and its agents and contractors.

**AUTHORITIES:**

In exercising authority under 33 U.S.C. 1341, 16 U.S.C. 1456, and RCW 90.48.260, Ecology has investigated this application pursuant to the following:

1. Conformance with applicable water quality-based, technology-based, and toxic or pretreatment effluent limitations as provided under 33 U.S.C. Sections 1311, 1312, 1313, 1316, and 1317 (FWPCA Sections 301, 303, 306 and 307);
2. Conformance with the state water quality standards as provided for in Chapter 173-201A WAC authorized by 33 U.S.C. 1313 and by Chapter 90.48 RCW, and with other appropriate requirements of state law; and
3. Conformance with the provision of using all known, available and reasonable methods to prevent and control pollution of state waters as required by RCW 90.48.010.

**CONDITIONS OF ORDER # 1629 AND WATER QUALITY CERTIFICATION:**

In view of the foregoing and in accordance with 33 U.S.C. 1341, RCW 90.48.120, RCW 90.48.260 and Chapter 173-201A WAC, water quality certification is granted to the U.S. Army Corps of Engineers subject to the following conditions:

**A. No Impairment of Water Quality:**

- A1. The Duwamish River is classified as Class B waters of the state. Certification of this proposal does not authorize U.S. Army Corps of Engineers to exceed applicable state water quality standards (Chapter 173-201A WAC) or sediment quality standards (Chapter 173-204 WAC). Water quality criteria contained in WAC 173-201A-030(1) and WAC 173-201A-040 shall apply to this project, unless otherwise authorized by Ecology. This Order does not authorize temporary exceedances of water quality standards beyond the limits established in WAC 173-201A-110(3). Furthermore, nothing in this certification shall absolve the permittee from liability for contamination and any subsequent cleanup of surface waters or sediments occurring as a result of project construction or operations.
- A2. Turbidity in Class B waters shall not exceed 10 NTU over background when the background turbidity is 50 NTU or less, or have more than a 20 percent increase in turbidity when the background turbidity is more than 50 NTU.

**B. Notification**

- B1. U.S. Army Corps of Engineers shall provide notice to Ecology's Alice Kelly at least 3 days prior to the start of construction. Notification can take place by e-mail to [akel461@ecy.wa.gov](mailto:akel461@ecy.wa.gov), telephone to (425) 649-7145, fax to (425) 649-7098, or in writing.

**C. Upland Construction, Excavation and Grading**

- C1. Cleanup of the upland soils shall be remediated such that the soil and groundwater at the site shall meet the provisions of the Model Toxics Control Act (Chapter 173-340 WAC) before final grading is completed and before a connection is made to the Duwamish River.
- C2. Dewatering water shall not be discharged to surface water unless testing indicates that it meets all water quality standards at the point of discharge (note: there is no mixing zone for stormwater or dewatering of construction sites). Construction dewatering water not meeting water quality standards shall not be discharged to surface water.
- C3. Wash water containing oils, grease, or other hazardous materials resulting from wash down of equipment or working areas shall be contained for proper disposal, and shall not be discharged into state waters or storm drains.
- C4. Fuel hoses, oil drums, oil or fuel transfer valves and fittings, and all other equipment, etc., shall be checked daily for drips or leaks, and shall be maintained and stored properly to prevent spills into state waters. No refueling of equipment shall occur over, or within 50 feet of the river.
- C5. Equipment used for this project shall be free of external petroleum-based products.
- C6. A qualified ecologist shall be on site to oversee project construction and riparian planting.
- C7. Mudflat / marsh construction and installation of the inlet structure shall be isolated from the flow of the Duwamish River by not disturbing the existing riverbank at the proposed outlet. The undisturbed portion of riverbank at the proposed outlet shall be substantial enough to prevent flood flows at high tide from entering the new off channel area during construction.
- C8. Before water is diverted into the mudflat / marsh, project grading shall be complete and approved fish habitat components, streambed materials, and bank protection to prevent erosion shall be in place.
- C9. With seven calendar days of project grading work, all disturbed riparian areas shall be protected from erosion using vegetation or other means.

**D. In-water Construction**

- D1. WAC 173-201A-110(3) allows a 150-foot mixing zone for temporary exceedances of the turbidity standards during and immediately after necessary in-water or shoreline construction activities that result in the disturbance of in-place sediments. This certification does not authorize a mixing zone greater than that allowed by WAC 173-201A-110(3). The Applicant shall fully apply all known, available, and reasonable methods of prevention, control, and treatment (AKART). Within the mixing zone, the Class B standard for turbidity is waived. All other applicable water quality standards shall remain in effect within the mixing zone and all other water quality standards are to be met outside of the authorized mixing zone.
- D2. The waiver of specified standards within the mixing zone is intended for brief periods of time (such as a few hours or a day) and is not an authorization to exceed those standards for the entire duration of construction. In no case shall turbidity exceedances cause degradation of water quality that significantly interferes with or becomes injurious to characteristic water uses, including fisheries habitat, or causes long-term harm to the Duwamish River.
- D3. Timing Limitations: Excavation of the outlet of the off-channel habitat area to the river shall occur at low tide between July 1 and August 15.
- D4. Turbid water from initial connection to the Duwamish River shall be pumped upland to settle, receive treatment, infiltrate, evaporate, or be discharged to sanitary sewer, to control the amount of turbidity in the Duwamish River.
- D5. The fish habitat log structures shall be of fir, cedar, or other approved coniferous species.
- D6. Fish habitat components and bank protection material shall be installed to withstand the 100-year peak flows.
- D7. **Water Quality Monitoring:**  
Sampling for turbidity shall occur as follows:
- Timing of samples: a minimum of every two hours throughout the first day of in-water construction activity. A background sample shall be collected before construction begins each day. Subsequent sampling is dependent upon monitoring results, but shall be a minimum of three times per day during in-water activity if no exceedances are detected. Sampling shall increase if exceedances are detected.
  - Location of samples: Background samples shall be collected upstream or upgradient of the area of activity, and 150 feet downstream or down current from the construction or activity.

- Reporting of results: Results of water quality monitoring shall be submitted to Department of Ecology, Federal Permit Coordinator, 3190 – 160<sup>th</sup> Avenue SE, Bellevue, WA, 98008-5452, fax 425-649-7098. If no exceedances are detected, results shall be submitted once a week. If exceedances are detected, results shall be submitted daily, and contingency measures and reporting as required by Condition F1 shall be implemented.

**E. Stormwater Management:**

- E1. The Applicant shall comply with the Stormwater Management Manual for Western Washington, August 2001 and the “Construction Stormwater Pollution Prevention and Sediment and Erosion Control Plan, North Wind’s Weir Intertidal Restoration Project, Tukwila, King County, Washington” prepared by the US Army Corps dated February 19, 2004.
- E2. Use of flocculent, as described in plan notes on page 4 of 6, is not authorized by this certification.
- E3. During construction, the Applicant shall comply with all stormwater requirements within the Stormwater General Permit for Construction Activity (NPDES Permit) issued for this project, or any individual stormwater discharge permit Ecology may issue for this project.
- E4. Work in or near waters of the state shall be done so as to minimize turbidity, erosion, and other water quality impacts. Construction stormwater, sediment and erosion control Best Management Practices suitable to prevent exceedances of state water quality standards (e.g., detention and/or infiltration areas, silt fences, etc.), shall be in place before starting clearing, excavating, and grading work at the impact site.

**F. Reporting and Monitoring:**

- F1. "As-Built" Report: An "as-built" report documenting the final design of the restoration site shall be prepared when site construction and planting is completed. The report shall include the following:
  - Vicinity map showing site access;
  - Final site topography;
  - Drawings that shall clearly identify the boundaries of the site;
  - The installed planting scheme showing quantities, densities, sizes, and approximate locations of plants, as well as plant sources and the time of planting;
  - Photographs of the area taken from permanent reference points;
  - Locations of photopoints, sampling and monitoring sites;
  - An analysis of any changes to the plan that occurred during construction.

- a. A copy of the "as-built" report shall be sent to Department of Ecology, Federal Permit Coordinator, 3190 – 160<sup>th</sup> Avenue SE, Bellevue, WA, 98008-5452, within 90 days of completing plant installation.
- F2. Maintenance and monitoring shall occur as specified in the "Maintenance and Monitoring Plan, North Wind's Weir Intertidal Restoration Project" dated January 28, 2004.
- F3. Goose excluders shall be used to prevent overgrazing by geese at the site.
- F4. Installation of the project plantings shall be completed prior to the start of the first growing season (March 1) subsequent to project clearing or grading.
- F5. Project plantings shall be maintained and irrigated as necessary to ensure 80 percent or greater survival at the end of five years.
- F6. Spring and fall inventories for invasive species shall be taken annually for the first five years post-construction.
- F7. Invasive species shall be controlled such that they do not exceed more than 10% total cover at any time.
- G. Emergency/Contingency Measures:**
- G1. In the event the Applicant is unable to comply with any of the permit terms and conditions due to any cause, the Applicant shall:
  - Immediately take action to stop, contain, and clean up unauthorized discharges or otherwise stop the violation and correct the problem.
  - Notify Ecology of the failure to comply. Spill events shall be reported immediately to Ecology's 24-Hour Spill Response Team at (425) 649-7000, and within 24 hours to Ecology's Alice Kelly at (425) 649-7145.
  - Submit a detailed written report to Ecology within five days that describes the nature of the violation, corrective action taken and/or planned, steps to be taken to prevent a recurrence, results of any samples taken, and any other pertinent information.
- H. General Conditions:**
- H1. For purposes of this Order, the term "Applicant" shall mean U.S. Army Corps of Engineers and its agents, assigns, and contractors.

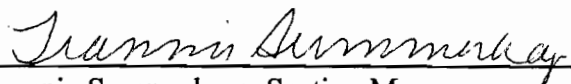
- H2. This certification does not exempt and is provisional upon compliance with other statutes and codes administered by federal, state, and local agencies.
- H3. The applicant will be out of compliance with this certification if the project is constructed and/or operated in a manner not consistent with the project description contained in the Public Notice for certification, or as otherwise approved by Ecology. Additional mitigation measures may be required through other local, state, or federal requirements.
- H4. The applicant will be out of compliance with this certification and must reapply with an updated application if five years elapse between the date of the issuance of this certification and the beginning of construction and/or discharge.
- H5. The applicant will be out of compliance with this certification and must reapply with an updated application if the information contained in the Public Notice is voided by subsequent submittals to the federal agency. Any future action at this project location, emergency or otherwise, that is not defined in the Public Notice, or has not been approved by Ecology, is not authorized by this Order. All future actions shall be coordinated with Ecology for approval prior to implementation of such action.
- H6. Copies of this Order shall be kept on the job site and readily available for reference by Ecology personnel, the construction superintendent, construction managers and foremen, and state and local government inspectors. To avoid violations or non-compliance with this Order, the applicant shall ensure that project managers, construction superintendents, and other responsible parties have read and understand relevant aspects of this Order, the NPDES permit if applicable, and any subsequent revision or Ecology-approved plans.
- H7. The Applicant shall provide to Ecology a signed statement (attachment A) from each project manager and construction superintendent working at the project site that they have read and understand the conditions of the above-referenced permits, plans, and approvals. These statements shall be provided to Ecology no less than seven (7) days before construction begins at the site.
- H8. The applicant shall provide access to the project site upon request by Ecology personnel for site inspections, monitoring, necessary data collection, or to ensure that conditions of this Order are being met.
- H9. Nothing in this Order waives Ecology's authority to issue additional orders if Ecology determines further actions are necessary to implement the water quality laws of the state. Further, Ecology retains continuing jurisdiction to make modifications hereto through supplemental order, if additional impacts due to project construction or operation are identified (e.g., violations of water quality standards, downstream erosion, etc.), or if additional conditions are necessary to further protect the public interest.

H10. Liability: Any person who fails to comply with any provision of this Order shall be liable for a penalty of up to ten thousand dollars (\$10,000) per violation for each day of continuing noncompliance.

**Appeal Process:**

Any person aggrieved by this Order may obtain review thereof by appeal, within thirty (30) days of receipt of this Order, to the Washington Pollution Control Hearings Board, P.O. Box 40903, Olympia, WA 98504-0903. Concurrently, a copy of the appeal must be sent to the Department of Ecology, Shorelands and Environmental Assistance Program, P.O. Box 47600, Olympia, WA 98504-7600. These procedures are consistent with the provisions of Chapter 43.21B RCW and the rules and regulations adopted thereunder.

Dated 10/1/04 at Bellevue, Washington.

  
Jeannie Summerhays, Section Manager  
Shorelands and Environmental Assistance  
Program  
Department of Ecology  
State of Washington

## **APPENDIX B**



UNITED STATES DEPARTMENT OF COMMERCE  
National Oceanic and Atmospheric Administration  
NATIONAL MARINE FISHERIES SERVICE  
Northwest Region  
7600 Sand Point Way N.E., Bldg. 1  
Seattle, WA 98115

April 10, 2001

Colonel Ralph H. Graves  
District Engineer  
Corps of Engineers, Seattle District  
Post Office Box 37551  
Seattle, Washington 98124-3755

Attention: Patrick T. Cagney

Re: Section 7 Informal Consultation on the U.S. Army Corps of Engineers' Green Duwamish  
Ecosystem Restoration Program, King County, Washington (NMFS No. WSB-00-423) and  
Essential Fish Habitat Consultation.

Dear Colonel Graves:

This correspondence is in response to your request for consultation under the Endangered  
Species Act (ESA). Additionally, this letter serves to meet the requirements for consultation  
under the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens  
Act).

#### Endangered Species Act

The National Marine Fisheries Service (NMFS) has reviewed the August 31, 2000 request for  
concurrence with your findings of "may affect, not likely to adversely affect (NLAA)" for the  
above referenced program, based on the Programmatic Biological Assessment (PBA, June 2000),  
Final Feasibility Report (October 2000), and Supplemental Letter (March 27, 2001). Your  
findings in regard to the listing of Puget Sound chinook salmon (*Oncorhynchus tshawytscha*) as  
Threatened under the ESA. This consultation with the United States Army Corps of Engineers  
(ACOE) is conducted under section 7(a)(2) of the ESA, and its implementing regulations, 50  
CFR Part 402.

The NMFS has evaluated the 50 projects in this ten-year program directed at ecosystem habitat  
restoration and enhancement, largely for salmonids and especially Chinook salmon, and concurs  
with your findings of "may affect, not likely to adversely affect," to either the species or the  
designated critical habitat for most of the projects (See Table 1). Based on the ACOE's  
Supplemental Letter of March 27, 2001 to the PBA, NMFS agrees with the assignment of the  
projects into four groups: early action (Calendar Year 2001), Phase 1 projects (Years 2002-  
2003), Phase 2 (Years 2004-2009), and those that require an individual consultation or  
reinitiation under this consultation, based on requiring more detailed construction plans. Five  
projects during Phase 1 are considered Demonstration Projects which will provide information  
on how to better implement larger scale projects planned for Phase 2 which ultimately occur at



-2-

multiple sites or units.

Table 1 Green Duwamish Ecosystem Restoration Program Projects

Project No	Project Name	Phase	ESA Status
<u>Marine Projects</u>			
1	Elliott Bay Nearshore	1	Concur
<u>Tidally-Influenced Estuarine Projects</u>			
2	Site 1, Duwamish	1	Concur
3	Riverton Side Channel	1	Concur
4	Codiga Farms	Early Action	Concur
<u>Free-Flowing Riverine Projects</u>			
5	Black River Marsh	2	Concur
6	Gilliam Creek	2	Concur
7	Lower Springbrook Creek	1	Concur
8	Upper Springbrook Creek	1	Concur
9	Mill Creek East	2	Concur
10	Garrison Creek	2	Concur
11	Mullen Slough, Prentice Nursery Reach	2	Concur
12	Mullen Slough Reach	2	Concur
13	Mill Creek, Schuler Brothers Reach	2	Concur
14	Mill Creek, Merlino Reach	2	Concur
15	Mill Creek, Wetland 5 K Reach	2	Concur
16	Mill Creek, Goedeke Reach	2	Concur
17	Green River Park	1	Concur
18	Horsehead Bend Side Channel	1	Concur
19	NE Auburn Creek	1	Concur
20	Meridian Valley Creek	1	Concur
21	Lake Meridian Outlet Relocation	1	Concur
22	Olson Creek	1	Concur
23	Riverside Estates Side Channel	2	Concur
24	Mainstem Maintenance	1	Concur for Demo <sup>1</sup>
25	Porter Levee	2	Concur
26	Kaech Levee Pond	2	Concur
27	Ray Creek Trib Corridor	2	Concur
28	Hamikami Levee Modification	2	Concur
29	Turley Levee Setback	2	Concur
30	Loans Levee Setback	1	Concur
31	Burns Creek Restoration	1	Concur
32	Middle Green River Large Woody Debris	1	Concur for Demo

-3-

33	Middle Green River Gravel Replacement	1	Concur for Demo
34	Flaming Geyser Landslide	2	Individual <sup>2</sup>
35	Flaming Geyser Side Channel	2	Concur
36	Newaukum Creek	1	Concur for Demo
37	Big Spring Creek	2	Concur
38	Brunner Slough	1	Concur
39	Upper Green R Side Channel Enhancement	2	Individual
40	Upper Green River Gravel Replacement	1	Concur for Demo

Above Howard Hansen Dam

41	Gale Creek	1	Concur <sup>3</sup>
42	Boundary Creek	2	Concur <sup>3</sup>
43	Sweeney Creek	Early Action	Concur <sup>3</sup>
44	Olsen Creek	2	Concur <sup>3</sup>
45	May Creek	2	Concur <sup>3</sup>
46	Maywood Creek	2	Concur <sup>3</sup>
47	Gold Creek	2	Concur <sup>3</sup>
48	Sunday Creek Riparian Planting	1	Concur
49	North East Creek	2	Concur <sup>3</sup>
50	Volunteer Revegetation	1	Concur

<sup>1</sup> Concurrence as NLAA for one demonstration unit in each project.

<sup>2</sup> Either reinitiate this consultation or initiate a new consultation, based on further Project designs.

<sup>3</sup> Culvert replacement projects will use NMFS' Guidelines for Salmonid Passage at Stream Crossings, Final Draft, March 28, 2000 (Appended).

Those restoration projects in which NMFS concurs provide an increase in quantity of critical and essential fish habitat through the removal of upland fill and the removing of fish passage impediments and an increase in quality of the critical and essential fish habitat because of the reasons provided in your Biological Assessment and Supplemental Letter: 1) the work will be done during a time of the year when chinook salmon are not present; 2) most of the upland construction will take place "in the dry" with final connection to the aquatic environment during permissible periods; 3) the implementation employs a landscape ecological approach for the entire watershed from the headwaters of the Green River through the Duwamish estuary to marine habitats in Elliott Bay shallow subtidal substrates; 4) these projects will complement other ongoing Green-Duwamish River Basin restoration and mitigation efforts; and 5) the project will meet all of the Washington Department of Fish and Wildlife Hydraulic Project Approval conditions.

This concludes informal consultation on these actions in accordance with 50 CFR 402.14(b)(1). The ACOE must reinitiate this ESA consultation if: 1) new information reveals effects of the action that may affect listed species in a way not previously considered; 2) the action is modified

-4-

in a manner that causes an effect to the listed species that was not previously considered; or 3) a new species is listed, or critical habitat designated, that may be affected by the identified action.

### Essential Fish Habitat

Federal agencies are obligated, under Section 305 of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) (16 USC 1855(b)) and its implementing regulations (50CFR600), to consult with NMFS regarding actions that are authorized, funded, or undertaken by that agency, that may adversely affect Essential Fish Habitat (EFH). The MSA (§3) defines EFH as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." Furthermore, NMFS is required to provide the Federal agency with conservation recommendations which minimize the adverse effects of the project and conserve EFH. This consultation is based, in part, on information provided by the Federal agency and descriptions of EFH for Pacific coast groundfish, coastal pelagic species, and Pacific salmon contained in the Fishery Management Plans produced by the Pacific Fisheries Management Council.

The proposed actions and action areas are described in the Biological Assessment. The action area covers four different types of habitats: marine, tidally-influenced estuarine, and riverine. The marine habitats contain designated EFH for various life-history stages of 46 species of groundfish, 4 coastal pelagic species, and three species of Pacific salmon; the estuarine habitats contain designated EFH for various life-history stages of 17 species of groundfish, four coastal pelagic species, and three species of Pacific salmon; and the riverine habitats include designated EFH for various life-history stages of three species of Pacific salmon (Table 2). Information submitted by the ACOE in the Programmatic Biological Assessment is sufficient for NMFS to conclude that the proposed action may adversely impact EFH in the short term by:

1. Increased siltation during in-water construction operations; and
2. Release of previously unknown chemical contamination during construction.

*EFH Conservation Recommendations:* The conservation measures that the ACOE included as part of the proposed action are adequate to minimize the long-term adverse impacts from this project to designated EFH for the species in Table 2. It is NMFS' understanding that the ACOE intends to implement the proposed activity with these built-in conservation measures that minimize potential adverse effect to the maximum extent practicable. While NMFS is satisfied with the nineteen General Best Management Practices (BMPs, in Section 2.5) in the PBA, short-term impacts should be minimized with the following recommendations.

1. Where gravel/cobble material is to be used in gravel replacement projects, it will be sieved (screen) to remove fine-grained materials smaller than 1/4" in diameter (BMP #15). It is assumed projects will require some level of maintenance over time; this should not include in-water dredging of sediments.

-5-

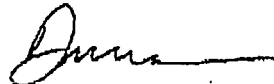
2. Construction activities will cease if chemical contamination found at any site exceeds the State of Washington sediment standards or Model Toxics Control Act, where applicable (BMP #16), until the contamination is either removed or the project abandoned.

Please note that the MSA (§305(b)(4)(B)) requires the Federal agency to provide a written response to NMFS' EFH conservation recommendations within 30 days of its receipt of this letter.

This concludes EFH consultation in accordance with the MSA and 50CFR600. The ACOE must reinitiate EFH consultation with NMFS if the proposed action is substantially revised in a manner that may adversely affect EFH, or if new information becomes available that affects the basis for NMFS' EFH conservation recommendations (50 CFR 600.920(k)).

This concludes ESA and EFH consultations. If you have questions regarding either of these consultations, please contact Robert Clark at 206-526-4338.

Sincerely,



Donna Darm  
Acting Regional Administrator

-6-

Table 2. Species of fishes with designated EFH in the proposed action areas (M = Marine, E = Estuarine, R = Riverine).

Groundfish Species	redstripe rockfish (M) <i>S. proriger</i>	Dover sole (M, E) <i>Microstomus pacificus</i>
spiny dogfish (M, E) <i>Squalus acanthias</i>	rosethorn rockfish (M) <i>S. helvomaculatus</i>	English sole (M) <i>Parophrys vetulus</i>
big skate (M) <i>Raja binoculata</i>	rosy rockfish (M) <i>S. rosaceus</i>	flathead sole (M, E) <i>Hippoglossoides elassodon</i>
California skate (M, E) <i>Raja inornata</i>	rougeye rockfish (M) <i>S. aleuticus</i>	petrale sole (M, E) <i>Eopsetta jordani</i>
longnose skate (M) <i>Raja rhina</i>	sharpchin rockfish (M) <i>S. zacentrus</i>	rex sole (M) <i>Glyptocephalus zachirus</i>
ratfish (M, E) <i>Hydrolagus collieri</i>	splitnose rockfish (M) <i>S. diploproa</i>	rock sole (M, E) <i>Lepidopsetta bilineata</i>
Pacific cod (M, E) <i>Gadus macrocephalus</i>	striptail rockfish (M) <i>S. saxicola</i>	sand sole (M, E) <i>Psettichthys melanostictus</i>
hake (M, E) <i>Merluccius productus</i>	tiger rockfish (M) <i>S. nigrocinctus</i>	starry flounder (M) <i>Platichthys stellatus</i>
black rockfish (M) <i>Sebastes melanops</i>	vermillion rockfish (M) <i>S. miniatus</i>	arrowtooth flounder (M, E) <i>Atheresthes stomias</i>
bocaccio (M, E) <i>S. paucispinis</i>	yelloweye rockfish (M) <i>S. ruberrimus</i>	
brown rockfish (M, E) <i>S. auriculatus</i>	yellowtail rockfish (M) <i>S. flavidus</i>	Coastal Pelagic Species
canary rockfish (M) <i>S. pinniger</i>	shortspine thornyhead (M) <i>Sebastolobus alascanus</i>	anchovy (M, E) <i>Engraulis mordax</i>
China rockfish (M) <i>S. nebulosus</i>	cabezon (M, E) <i>Scorpaenichthys marmoratus</i>	Pacific sardine (M, E) <i>Sardinops sagax</i>
copper rockfish (M, E) <i>S. caurinus</i>	lingcod (M, E) <i>Ophiodon elongatus</i>	Pacific mackerel (M, E) <i>Scomber japonicus</i>
darkblotch rockfish (M) <i>S. crameri</i>	kelp greenling (M, E) <i>Hexagrammos decagrammus</i>	market squid (M, E) <i>Loligo opalescens</i>
greenstriped rockfish (M) <i>S. elongatus</i>	sablefish (M, E) <i>Anoplopoma fimbria</i>	Pacific salmon Species
Pacific ocean perch (M) <i>S. alutus</i>	Pacific sanddab (M, E) <i>Clitharichthys sordidus</i>	chinook (M, E, R) <i>Oncorhynchus tshawytscha</i>
quillback rockfish (M, E) <i>S. maliger</i>	butter sole (M, E) <i>Isopsetta isolepis</i>	coho (M, E, R) <i>O. kisutch</i>
redbanded rockfish (M) <i>S. babcocki</i>	curlfin sole (M, E) <i>Pleuronichthys decurrens</i>	Puget Sound pink (M, E, R) <i>O. gorbuscha</i>



## United States Department of the Interior

### FISH AND WILDLIFE SERVICE

Western Washington Office

510 Desmond Drive SE, Suite 102

Lacey, Washington 98503

Phone: (360) 753-9440 Fax: (360) 753-9008

MAR 27 2001

Colonel Ralph H. Graves  
District Engineer  
Seattle District, Corps of Engineers  
P.O. Box 3755  
Seattle, Washington 98124-3755

Attention: Mr. Pat Cagney

(FWS Reference: 1-3-01-I-0906)

Dear Colonel Graves:

This letter responds to your August 31, 2000 transmittal letter and Programmatic Biological Assessment (PBA) for the Green/Duwamish Ecosystem Restoration Program which we received on September 5, 2000. We are able to provide partial concurrence.

The PBA covers forty-nine restoration projects within the Green/Duwamish River Basin that the Corps of Engineers (Corps) is proposing for implementation over a ten year period. Fish and Wildlife Service (Service) and Corps staff have discussed on a number of occasions the need for more detailed project information to complete the Section 7 consultation. The Service proposed that the Corps meet annually with the Service, prior to the construction season, to review any refinements in project details that could have an impact on federally listed species, but especially the Coastal/Puget Sound bull trout. The Corps informed us in January 2001, that they were uncomfortable with the requirement for future reviews because of the uncertainties that could potentially affect project implementation. Instead, the Corps requested that the Service treat the PBA as a batch consultation. You further asked that we separate out any of the projects that we considered to be lacking in sufficient detail to complete the consultation, as well as projects for which we could not concur with the Corps' effect determination. For the purposes of this consultation, we are treating the forty-nine projects described in the PBA as a batch consultation.

The Corps of Engineers has determined that the actions, as described in its PBA, are not likely to adversely affect the bald eagle (*Haliaeetus leucocephalus*), marbled murrelet (*Brachyramphus marmoratus*), northern spotted owl (*Strix occidentalis caurina*), gray wolf (*Canis lupus*), Canada lynx (*Lynx canadensis*) and Coastal/Puget Sound bull trout (*Salvelinus confluentus*).

Based on the information provided in the PBA and the Corps' final feasibility report for the Green/Duwamish River Basin ecosystem restoration study, we concur with the Corps' determination of effects for the bald eagle, marbled murrelet, northern spotted owl, gray wolf, and Canada lynx. With regard to the Coastal/Puget Sound bull trout, we concur with the Corps' effect determination for forty-three of the forty-nine projects described in the PBA and listed in the attachment to this letter. These projects are covered under this consultation for a period of ten years.

RECEIVED  
MAR 30 2001

USACE  
REGULATORY BRANCH

We do not concur with the Corps' "not likely to adversely effect" determination for the bull trout for the following six projects: (1) mainstem maintenance (Auburn to Elliott Bay); (2) middle Green River large woody debris placement; (3) middle Green River gravel replacement; (4) Flaming Geyser landslide control; (5) Newaukum Creek restoration; and (6) upper Green River gravel replacement. We recommend that the Corps consult individually on these projects.

Although these six projects are expected to benefit bull trout in the long term, we believe they have the potential to adversely affect bull trout in the short term. These projects are larger and more complex than the others, involve significant in-water work, and have not been developed in enough detail at this time for us to conclude that the adverse impacts to bull trout would be insignificant. As project details become more refined, our concern for these projects and their potential impact to bull trout may lessen. In the absence of detailed project information, we need to be more cautious and therefore conclude that bull trout foraging could be adversely affected in the short term as a result of fine sediment releases during the modification of streambanks, the construction of engineered log jams, the addition of spawning gravels and the construction of other habitat improvements. Elevated levels of sediment can reduce the abundance of bull trout prey resources as well as make it more difficult for bull trout to locate their prey.

This concludes informal consultation pursuant to 50 CFR 402.13. This project should be re-analyzed if new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not considered in this consultation; if the action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this consultation; and/or, if a new species is listed or critical habitat is designated that may be affected by this project.

If you have further questions about this letter or your responsibilities under the Act, please contact Gwill Ging at (360) 753-6041 or John Grettenberger at (360) 753-6044.

Sincerely,



*for* Carol Schuler, Manager  
Western Washington Office

**Attachment A.** The U.S. Fish and Wildlife Service concurs with Corps of Engineers' not likely to adversely affect determination for the following projects:

Lower Green/Duwamish River Sites

Elliott Bay Nearshore  
Site 1, Duwamish  
Riverton Side Channel  
Codiga Farms

Middle Basin Restoration Sites

Black River Marsh  
Gilliam Creek  
Lower Springbrook Creek  
Upper Springbrook Creek  
Mill Creek East  
Garrison Creek.  
Mullen Slough, Prentice Nursery Reach  
Mullen Slough Reach  
Mill Creek, Schuler Brothers Reach  
Mill Creek, Merlino Reach.  
Mill Creek, Wetland 5K Reach.  
Mill Creek, Goedeke Reach  
Green River Park  
Horsehead Bend Side Channel.  
NE Auburn Creek  
Meridian Valley Creek  
Lake Meridian Outlet Relocation  
Olson Creek  
Riverside Estates Side Channel  
Porter Levee Setback  
Kaech Levee Pond  
Ray Creek Trib Corridor  
Hamikami Levee Modification  
Turley Levee Setback  
Loans Levee Setback  
Burns Creek Restoration  
Flaming Geysers Side Channel  
Big Spring Creek  
Brunner Slough  
Upper Green River Side Channel Enhancement

Upper Basin Restoration Sites:

Gale Creek  
Boundary Creek  
Sweeney Creek  
Olson Creek  
May Creek  
Maywood Creek  
Gold Creek  
Sunday Creek Riparian Planting  
North East Creek

## **APPENDIX C**



STATE OF WASHINGTON

**Office of Archaeology and Historic Preservation**

1063 S. Capitol Way, Suite 106 • PO Box 48343 • Olympia, Washington 98504-8343

Phone (360) 586-3065 • Fax Number (360) 586-3067

<http://www.oahp.wa.gov>

May 12, 2004

Mr. Thomas Mueller  
Environmental Resources Section  
Corps of Engineers-Seattle  
PO Box 3755  
Seattle, Washington 98124-3755

Re: North Wind's Weir Intertidal Restoration Project  
Log No: 051204-09-COE-S

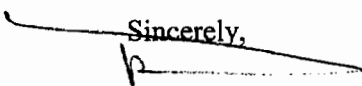
Dear Mr. Mueller;

Thank you contacting our office in regard to the proposed North Wind's Weir Intertidal Restoration Project in Tukwila, King County, Washington. Thank you for providing a copy of the cultural resources assessment by Ron Kent. We concur with his professional recommendations and your findings that No Historic Properties Affected.

We concur with your conditioning of the permit to assure professional archaeological monitoring, notification, and reporting requirements as detailed in your letter. We would appreciate receiving a copy of the monitoring report when available. We also would appreciate receiving any further correspondence or comments from concerned tribes or other parties that you receive as you consult under the requirements of 36CFR800.4(a)(4).

These comments are based on the information available at the time of this review and on the behalf of the State Historic Preservation Officer in conformance with Section 106 of the National Historic Preservation Act, as amended, and its implementing regulations 36CFR800. Should additional information become available, our assessment may be revised. Thank you for the opportunity to comment on this public notice and a copy of these comments should be included in subsequent environmental documents.

Sincerely,

  
Robert G. Whitlam, Ph.D.  
State Archaeologist  
(360) 586-3080  
email: [robw@cted.wa.gov](mailto:robw@cted.wa.gov)

## **APPENDIX D**



US Army Corps  
of Engineers  
Seattle District

# Public Notice

Planning Branch  
P.O. Box 3755  
Seattle, WA 98124-3755  
ATTN: Noel Gilbrough (PM-PL)

Public Notice Date: January 5, 2004  
Expiration Date: February 6, 2004  
Reference: CENWS-PL-04-02  
Name: North Wind's Weir Intertidal Restoration

## 30-DAY PUBLIC NOTICE

Interested parties are hereby notified that the U.S. Army Corps of Engineers, Seattle District (Corps) in partnership with King County Department of Natural Resources and Parks (KCDNRP) propose to restore the approximately 3.27-acre North Winds Weir project area to intertidal and riparian habitats. The site is located in Tukwila, Washington. This work is subject to Section 404 of the Clean Water Act, and is covered by the Nationwide Permit 27 process. The proposed project is described below and shown on the enclosed drawings. The purpose of this Public Notice is to solicit comments from interested persons, groups, and agencies.

### LOCATION

The project area is located along the eastern bank of the lower Duwamish River at approximately River Mile 6.2, in the southeast quarter of Section 4, Township 23 North, Range 4 East, within the City of Tukwila, Washington.

### PROJECT BACKGROUND

The lower Green/Duwamish River estuary was historically an area of very low gradient with a sinuous, meandering main channel. The estuarine mud flats and marshes were nearly completely destroyed by dredging and filling activities that occurred between the late 1800's and the mid-1900's. Ultimately, intertidal habitats in the Duwamish River were reduced from about 2,100-2,500 acres to less than 25 acres.

### PURPOSE AND PROJECT OBJECTIVE

Thus, the purpose of the North Wind's Weir Intertidal Restoration project is to remove the fill from the site, restore the natural shoreline and intertidal habitats, and restore the tidal connection between the site and the Duwamish River. Intertidal functions such as rearing and foraging habitat for juvenile salmonids and detrital export from salt marsh habitats would then be restored to the project area, as would the capacity of the river to sustain intertidal mudflat, marsh, and riparian habitats.

### AUTHORITY

Section 306 of the WRDA of 1990 authorized the Secretary of the Army to include environmental protection as one of the primary missions of the Corps. The Green/Duwamish Ecosystem Restoration Study stems from the Corps' authority under Section 216 of the River and Harbors and Flood Control Act of 1970, which enables the Corps to undertake restoration related to the hydrologic regime of aquatic ecosystems. Congress specifically authorized the Green/Duwamish River Basin Feasibility Study and thus the North Wind's Weir Intertidal Restoration project, in Section 101(b)(26) of WRDA 2000.

## PROPOSED PROJECT

The majority of the site would be lowered to elevations ranging from -1 to +4 feet NGVD 88 (+1.35 to 6.35 MLLW) and would be connected to the Duwamish River via an entrance off the east side of the rock weir and its associated scour pool (see Figures 2 through 5). This would create approximately 1.66 acres of tidal channel and associated intertidal mudflat (below elevation +4 NGVD 88) and approximately 0.76 acres of intertidal and high marsh between elevations +4 and +10 feet NGVD 88 (+6.35 and +12.35 MLLW). A scrub-shrub wetland community between elevations +10 and +12 feet NGVD 88 (+12.35 and +14.35 MLLW) of approximately 0.17 acres would gradually transition to a forested riparian buffer encompassing approximately 0.29 acres to the top of the area of excavation. The upstream side of the entrance channel would be armored and bank stabilized to better maintain the existing hydrodynamics of the shoreline, better preserve the undisturbed portion of the existing saltmarsh, and support a self-maintaining channel opening. The top and backside of the armoring would be capped with soil and planted with vegetation (likely willows) to increase habitat function and improve aesthetics. On in-coming tides, the site would fill with water through the tidal channel, flooding the mudflat and marsh areas. On very high tides, in-coming water would also likely overtop the existing marsh of the site and flood into the site through the restored marsh along the northern edge of the site. On out-going tides, water would flow off of the restored marsh and mudflat and exit the site through the tidal channel. The slopes and elevations are designed for the mudflats and marsh to drain completely at low tides; the tidal channel may retain some ponded water during some of the higher low tides of the year.

Much of the existing riprap and abandoned rubble along the shoreline would be removed and the slope currently colonized by Himalayan blackberries would be excavated and removed. This alternative would require grading of the western side of the existing intertidal marsh to match graded contours with existing contours. The Preferred Alternative would thus result in the loss of the 0.06 acres of the western extent of the existing intertidal marsh (approximately one-third of the marsh) and its replacement with approximately 0.76 acres of restored intertidal marsh habitat that would ultimately be of similar functional value to invertebrates, fish, and birds. Native species planted within the restored marsh area would likely include a variety of species selected for the anticipated tidal regime and salinity conditions of the site, such as Lyngby's sedge (*Carex lyngbyei*), Pacific silverweed (*Potentilla anserine* spp. *pacifica*), hardstem bulrush (*Scirpus acutus*), softstem bulrush (*Scirpus validus*), tufted hairgrass (*Deschampsia cespitosa*), and Douglas aster (*Aster subspicatus*) (Figure 5). Other emergent species may also be considered for the site, such as slough sedge (*Carex obnupta*), small-fruited bulrush (*Scirpus microcarpus*), and spike rush (*Eleocharis* spp.) based on the presence of these species in reference patches of intertidal vegetation along the Duwamish River.

In order to minimize the functional and temporal loss of the existing marsh, the portion of the marsh to be graded would be salvaged just prior to grading and replanted within the restoration site at the same elevation. Salvage would be accomplished by cutting the root-mat of the existing marsh into sections, sliding a steel plate under the root-mat, and then lifting out sections of the marsh and its root-mat. The salvaged pieces of marsh would then be transplanted to the appropriate elevation contour in the restored marsh within the same tidal cycle. If possible, the salvaged marsh would be transplanted contiguous with retained areas of the marsh to maximize the likelihood that it would re-root with minimal dieback. The expectation is that much of the relocated marsh would re-root within the restoration area and would thus retain its temporal and functional value to the suite of benthic invertebrates, fish, and wildlife that currently utilize this marsh.

In order to reduce grazing by geese within the newly planted marsh, a complex of goose excluders will be installed over and around the entire mudflat and marsh areas. Based on designs implemented on other restoration sites along the Duwamish shoreline, the excluders will use open weave steel mesh fencing to prevent 'walk-in' or 'float-in' access and overhead cables to prevent 'fly-in' access to the marsh. The large mesh of the fencing does not restrict access by juvenile salmonids. It is anticipated that these goose excluders will remain in place for a minimum of three years post-planting to allow the restored marsh time to establish and spread sufficiently to withstand herbivory by foraging geese.

During approximately the first three years post-planting, the scrub-shrub and riparian buffer vegetation would be seasonally irrigated by a temporary, above-ground irrigation system. The system would be set on a timer to allow for irrigation between May and October of each year. Once the plants are well established (as indicated by reduced mortality rates, evident growth, and the presence of flowers or fruits), the irrigation system would be removed from the site.

#### MITIGATION

As restoration, this project is considered self-mitigating.

#### ENDANGERED SPECIES

The Endangered Species Act of 1973, as amended, requires assessment of potential impacts to listed and proposed species. Listed and proposed species that may occur in the project vicinity include:

Bald Eagle (*Haliaeetus leucocephalus*)—threatened;  
Coastal/Puget Sound Bull Trout (*Salvelinus confluentus*)—threatened;  
Puget Sound Chinook Salmon (*Oncorhynchus tshawytscha*)—threatened;

In accordance with Section 7(a)(2) of the Endangered Species Act of 1973, as amended, federally funded, constructed, permitted, or licensed projects must take into consideration impacts to federally listed and proposed threatened or endangered species. The Corps prepared two Programmatic Biological Assessments (BA) to assess potential impacts of the proposed work on species protected under the Act, one for species under the jurisdiction of the USFWS and one for species under the jurisdiction of NOAA Fisheries. Both Services concurred with the not likely to adversely affect determinations presented. Copies of the Bas are available from the Corps upon request.

## CULTURAL AND HISTORIC RESOURCES

The District Engineer has reviewed the latest published version of the National Register of Historic Places, lists of properties determined eligible, and other sources of information. The following is current knowledge of the presence or absence of historic properties and the effects of the undertaking upon these properties:

Section 106 compliance studies completed to date include an examination of the electronic database containing the archaeological and historic site records of the Washington State Office of Archaeology and Historic Preservation (OAHP) and other background research. The records search indicated that no properties listed on the National Register of Historic Places (NRHP) and no sites or structures listed on the state inventory are located within the proposed project area. A professional cultural resources reconnaissance survey was conducted for the proposed project. The survey consisted of an examination of the archaeological and historic site records at the Washington State Office of Archaeology and Historic Preservation (OAHP) and a pedestrian survey of the project area. The records search indicated that no properties listed on the National Register of Historic Places (NRHP) are located within the proposed project area. The pedestrian survey did not find any evidence of prehistoric or historic-period cultural material within the proposed project area.

The District Engineer invites responses to this Public Notice from Native American Nations, Federal, State and local agencies, historical and archeological societies, and other parties likely to have knowledge of or concerns with historic properties in the area.

## PUBLIC HEARING

Any person may request, in writing and within the comment period specified in this notice, that a public hearing be held to consider this proposal. Requests for public hearings shall state, with particularity, the reason for holding a public hearing.

## EVALUATION

The decision whether to perform the proposed work will be based on an evaluation of the probable impact, including cumulative impacts, of the proposed activity on the public interest. That decision will reflect the national concern for both protection and utilization of important resources. The benefits that reasonably may be expected to accrue from the proposal must be balanced against its reasonably foreseeable detriments. All factors which may be relevant to the proposal will be considered, including the cumulative effects thereof; among those are conservation, economics, aesthetics, general environmental concerns, wetlands, historic properties, fish and wildlife values, flood hazards, floodplain values, land use, navigation, shoreline erosion and accretion, recreation, water supply and conservation, water quality, energy needs, safety, food and fiber production, mineral needs, considerations of property ownership, and, in general, the needs and welfare of the people.

The U.S. Army Corps of Engineers, Seattle District is soliciting comments from the public; Native American Nations; Federal, State, and local agencies and officials; and other interested parties in order to consider and evaluate the impacts of this activity. Any comments received will be considered by the Corps of Engineers to determine whether to modify, condition, or not proceed with the proposed work. To make this decision, comments are used to assess impacts on endangered species, historic properties, water quality, general environmental effects, and the other public interest factors listed above. Comments are also used to determine the need for a public hearing and to determine the overall public interest of the activity.

The evaluation of the activity on the public interest will include application of the guidelines promulgated by the Administrator, Environmental Protection Agency, under authority of Section 404(b) of the Clean Water Act. This evaluation will include an alternatives analysis.

#### ADDITIONAL EVALUATION

The State of Washington will review this work for consistency with the approved Washington Coastal Zone Management Program. A coastal zone consistency statement will be prepared and submitted to the Department of Ecology. A preliminary determination has been made that the proposed restoration project is consistent to the maximum extent practicable with the enforceable policies of the City of Tukwila and King County's Shoreline Management Programs.

A Section 401 water quality certification is requested from the State of Washington.

The North Wind's Weir was previously evaluated in the Final Programmatic Environmental Impact Statement and Restoration Plan (FPEIS) for the Green/Duwamish River Basin Ecosystem Restoration Program, prepared by the Seattle District Corps and King County DNRP in November 2000. In that document, this project was referred to as the 'Site 1' project. The project name was changed to avoid confusion with a documented cultural site upstream of the property.

Pursuant to the National Environmental Policy Act, a draft Environmental Assessment has been prepared to describe the design and impacts in greater detail. The draft Environment Assessment (EA) is posted and available on the Seattle District web site at: <<http://www.nws.usace.army.mil/ers/envirdocs.html>>.

#### COMMENT AND REVIEW PERIOD

Comments on these factors will be accepted, made part of the record, and will be considered in determining whether it would be in the best public interest to proceed with the proposed project. Comments should reach this office, Attn: Planning Branch, not later than the expiration date of this public notice to ensure consideration.

Requests for additional information should be directed to Mr. Noel Gilbrough, Project Manager, at (206) 764-3652 or Ms. Torrey Luiting, Environmental Coordinator, at (206) 764-4476.

Encl  
Drawings (8)

## **APPENDIX E**

February 5, 2004

Planning Branch  
US Army Corps of Engineers  
ATTN: Noel Gilbrough (PM-PL)  
P.O. Box 3755  
Seattle, WA 98124-3755

Reference: CENWS-PL-04-02  
Name: North Wind's Weir Intertidal Restoration

Dear Sirs:

As the owner of the adjacent property to the east of the proposed North Wind's Weir Intertidal Restoration and the business (Pacific Strapping Inc.) that operates from that property I am submitting in this letter some of my comments and concerns regarding the project.

While I do not have disagreement with the intent and objective of the project I have serious concerns as to the effect the project will have on my property and the surrounding local vicinity.

Currently the elevation of your project site functions as the levee to protect not only my property but also the surrounding area from potential flooding. The proposed construction at your site would cause the Corps Of Engineers to be removing the levee that protects my property, Boeing's property and virtually all of Allentown. This almost sounds like the opposite of what I as a citizen believe to be the COE's public mandate. I have grave reservations about taking the riverbank from almost 20 feet to 12 feet when we regularly experience greater than +13 high tides.

Also, the low portion of my property directly on the east side of the concrete wall that serves as the property boundary is below MHHW (8.97{NAVD88}, 11.32{Seattle Tide Tables}). As you are aware my property drains through an existing pipe running from this low point to the river under the North Wind's site. This issue will have to be addressed.

I am also concerned that the buffer zone from the east property line to the marsh and tide flats is very narrow. I see the potential for water to leach through the earth and undermine the wall along the east property line of the North Wind's site. The proposed plan with its' narrow buffer leaves very little room for safety and insurance from flooding.

Additionally and very importantly I am very concerned about the effect that bringing the river and wetlands closer to my property will have on potential development rights and the inherent value in the ability to further develop my property. My property is currently not subject to the Shoreline Management Act, nor in any regulatory proximity to wetlands that would restrict my rights to further development. These rights should not and cannot be usurped.


Planning Branch,  
US Army Corps of Engineers  
February 5, 2004  
Page 2

Currently the trees along the east property line are undermining the asphalt on my property. While trees are beautiful the current species are a nuisance. The fact that the roots from these trees have damaged the pavement on the adjacent property should be addressed.

In the plan for the North Wind's Weir I do not see any consideration of a paved curb or sidewalk or even a contingency for parallel parking along the street. I feel that leaving the dirt edge as proposed will create a chronic mud hole that will destroy the ambiance and positive nature of the project.

I would like to thank you for providing the opportunity to members of the community to voice their concerns and comments. I look forward to working with the COE and KCDNR to bring this community improvement to a positive and successful completion

Sincerely,

A handwritten signature in black ink, appearing to read "Sven R. Bitners". The signature is fluid and cursive, with a long horizontal flourish extending to the right.

Sven R. Bitners

2/4/04

TO: Victoria T. Luiting  
Environmental Resources Section

FM: Linda Hanson  
WRIA 9 Project Coordinator

RE: North Wind's Weir Intertidal Restoration – Draft Environmental Assessment

Thanks for the opportunity to submit the following brief comments on the Environmental Assessment of the North Wind's Weir Intertidal Restoration Draft of January 5, 2004. My comments are limited to my WRIA 9 perspective and/or personal observations about the site and proposed plan.

The plan appears to be well considered, including both maximum potential for habitat restoration for salmonid species, while protecting and augmenting existing marsh zones. Recent studies have confirmed that habitat restoration in this section of the river is particularly important to the growth and survival of migrating juvenile chinook salmon.

Following are my suggestions for amendments of the Draft Environmental Assessment:

- On page iii in the fourth paragraph, it would be more accurate to describe the site as “compacted” and/or disturbed because there is a low percentage of “paving” on the property.
- On page 3 in section “1.4 Associated Studies and Reports”, should reference two significant WRIA 9 documents:

“Habitat Limiting Factors and Reconnaissance Assessment Report, Green/Duwamish and Central Puget Sound Watersheds (WRIA 9 and Vashon Island), Washington Conservation Commission and the King County Department of Natural Resources, 2000”

“Near-Term Action Agenda for Salmon Habitat Conservation, Green/Duwamish River and Central Puget Sound Watershed, Water Resource Inventory Area 9, May 2002”

Reference to these documents may also be appropriate on page 11 in section 4.0 and on page 45 in section 11.0.

- On Page 5, at the end of the second paragraph, it would be more accurate to say that the site is fenced as a barrier to vehicles, while permitting pedestrian access. To say that access is “unrestricted” suggests that the property is open to all types of access.
- On page 9 in section 3.2 and the site map 6 of 6 (in the scrub shrub and riparian/upland sections), the proposed plants are for the most part deciduous. A broader mix with native evergreen species would help limit erosion and diversify winter habitat, and at the same time strengthen the visual quality of the finished restoration.

Thanks again for the opportunity to comment on the Environmental Assessment of the North Wind’s Weir Intertidal Restoration Draft. If you have any questions please contact me at 206-296-8383 or [linda.hanson@metrokc.gov](mailto:linda.hanson@metrokc.gov).

Cc: Jon Hansen, Sr. Ecologist, King County DNRP